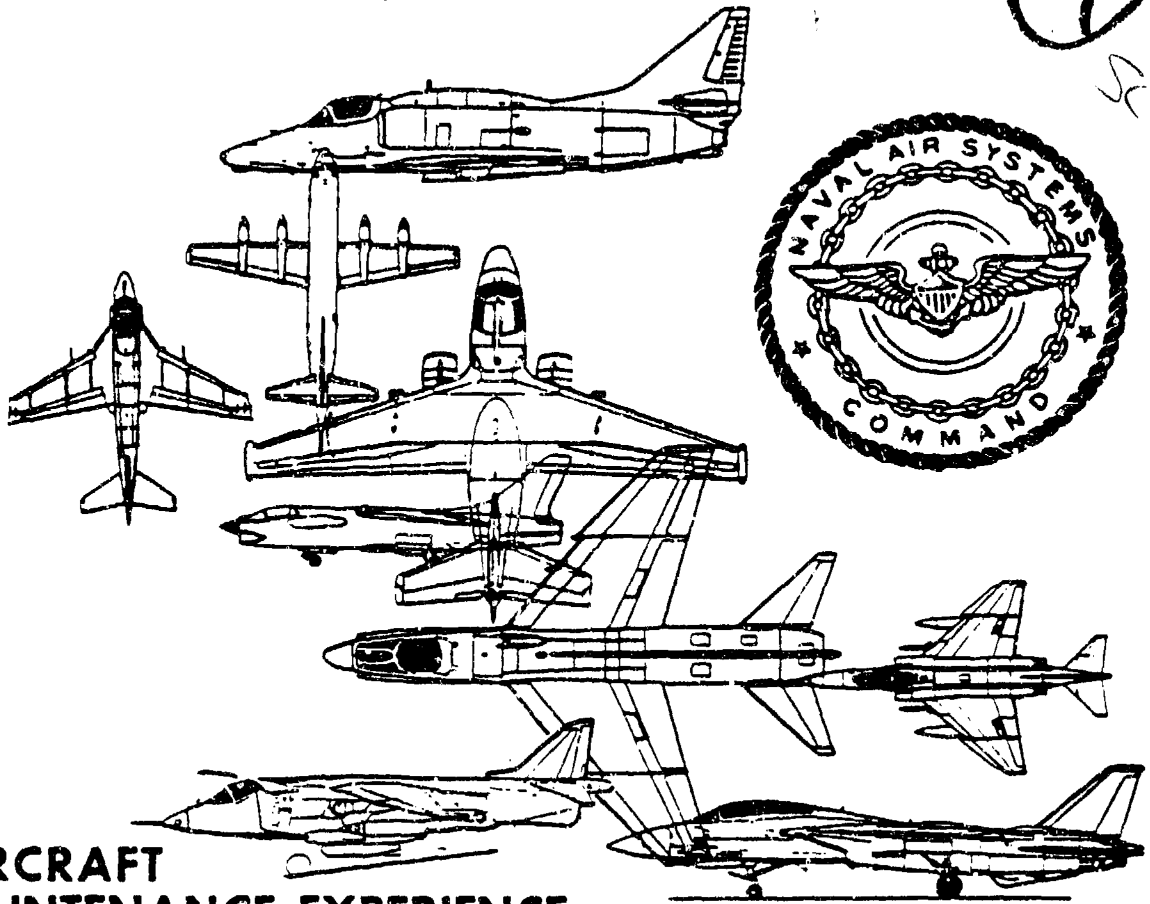

AIRCRAFT MAINTENANCE EXPERIENCE DESIGN HANDBOOK

Prepared for

MAINTENANCE POLICY AND ENGINEERING DIVISION
Naval Air Systems Command
Washington, D. C. 20361

REVISION A
SEPTEMBER 1979

AIRCRAFT MAINTENANCE EXPERIENCE DESIGN HANDBOOK

VOUGHT CORPORATION
DALLAS, TEXAS

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REVISION A
TO
AIRCRAFT MAINTENANCE EXPERIENCE DESIGN HANDBOOK

Revision A adds scheduled inspections and other support actions to the Aircraft Maintenance Experience Design Handbook. Section 3.0 has been revised and Sections 5.22 thru 5.26 have been added.

REMOVE PAGES: V thru XI, 3-1 thru 3-17, 5-1, 5-2 and Reference 3

INSERT PAGES: V thru XI, 3-1 thru 3-18, 5-1, 5-2, 5-129 thru 5-190, Reference 3

All revisions are indicated by a black vertical line in the right/left margin on the page which the change appears. Revised pages without indicated change marks are spill over due to the report being prepared by automatic processing. Pages 5-129 thru 5-190 are new additions to the report.

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The Aircraft Maintenance Experience Design Handbook was developed for the Maintenance Policy and Engineering Division of the Naval Air Systems Command. This Handbook presents guideline procedures for evaluating new aircraft quantitative maintainability parameters, establishing weapon system requirements and analyzing component designs.

The Aircraft Maintenance Experience Design Handbook is organized into

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three parts. Parts I and II addressing maintenance at both the Organizationa and Intermediate levels while Part III is primarily a discussion of component installations at the Organizational level. Part I contains a description of the technical analysis leading to the development of the Maintainability Index Model (MIM). Part II provides the instructions for the application of the model for establishing maintainability requirements and evaluating maintainability predictions. Part II also provides maintainability data on various aircraft and their systems which will aid the user in making procedure adjustments for special aircraft applications. Part III presents quantitative and qualitative information concerning the maintainability attributes of selected maintenance significant component installations. Those installation characteristics that have proven to be effective in expediting or simplifying maintenance are highlighted.

The procedures are presented in a sequence to permit analysis for the total aircraft, or down to aircraft system or component level. Design and maintenance engineers can use this information for analyzing new systems and components or those being considered for change.

AIRCRAFT
MAINTENANCE EXPERIENCE
DESIGN HANDBOOK

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ILLUSTRATIONS AND TABLES

Separate listings of the Illustrations and Tables contained in the Handbook are not provided due to the repetitive nature of the titles and the voluminous extent of the individual listings. To insure completeness of the text, the inclusive numbers for each section are included. With one exception, (Section 5.0), they are numbered sequentially within each section and all numbers are prefixed with the section or appendix identifier in which they appear.

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3.0 MAINTAINABILITY INDEX MODEL (MIM)

The prediction tool used to determine two-digit WUC maintenance values involves the use of a Maintainability Index Model (MIM). The MIM projects realistic maintainability estimates for Navy Fighter, Attack and ASW aircraft for use during conceptual and development design. The model is based on regression analysis techniques which relate historical maintenance data (MMH/FH and MA/FH) to design and performance parameters, i.e. weight, thrust, speed, etc. This technique was used successfully by the Northrop Corporation in a report on maintenance characteristics of United States Air Force tactical fighter aircraft (Reference 11). Techniques from that study were modified and expanded to include additional maintenance data. The result is that the MIM and its complete set of index equations provides the Navy with a unique capability to rapidly evaluate and predict new aircraft maintenance requirements.

3.1 GENERAL DESCRIPTION

This section discusses the procedure used to predict MMH/FH, MA/FH, MMH/MA, EMT/MA and MEN at Organizational ("O") and Intermediate ("I") levels for a 3-M (Class 1) and FSE (Class 3) environment. A logic flow diagram depicting the derivation and operation of the MIM is presented in Figure 3.1. Section 3.0 also contains sample calculations and model validation.

3.2 MODEL DERIVATION

The maintainability characteristics of tactical fighter/attack aircraft are directly related to design and performance parameters (Reference 10). Selection of these parameters along with a valid maintenance data base was the first step in developing the MIM.

3.2.1 Aircraft Parameters

It is recognized that increased performance of modern aircraft results in increased maintenance requirements. Although the increase in maintenance is probably due to increasing system complexity, accurate measure of complexity is difficult to derive and to apply consistently. Through considerable research and trial and error, a viable procedure which can accurately and consistently measure system complexity was developed. This procedure, which is used in this text, involves the use of design and performance parameters to establish a relationship between increases in complexity and maintenance requirements.

The Fighter/Attack/ASW aircraft considered in the correlation analysis were chosen because they provided a broad historical data base. Availability of maintenance data and design parameters were the main factors in the selection of these late model aircraft. Listed below are the aircraft used in the two-digit WUC analysis by type aircraft and year of first Fleet delivery:

A-4M	1971	F-4J	1966
A-6E	1971	F-8J	1968
A-7E	1969	F-14A	1973
AV-8A	1971	S-3A	1974

These aircraft possess the range and variation of design characteristics necessary to produce valid estimating relationships. The empty weight of the

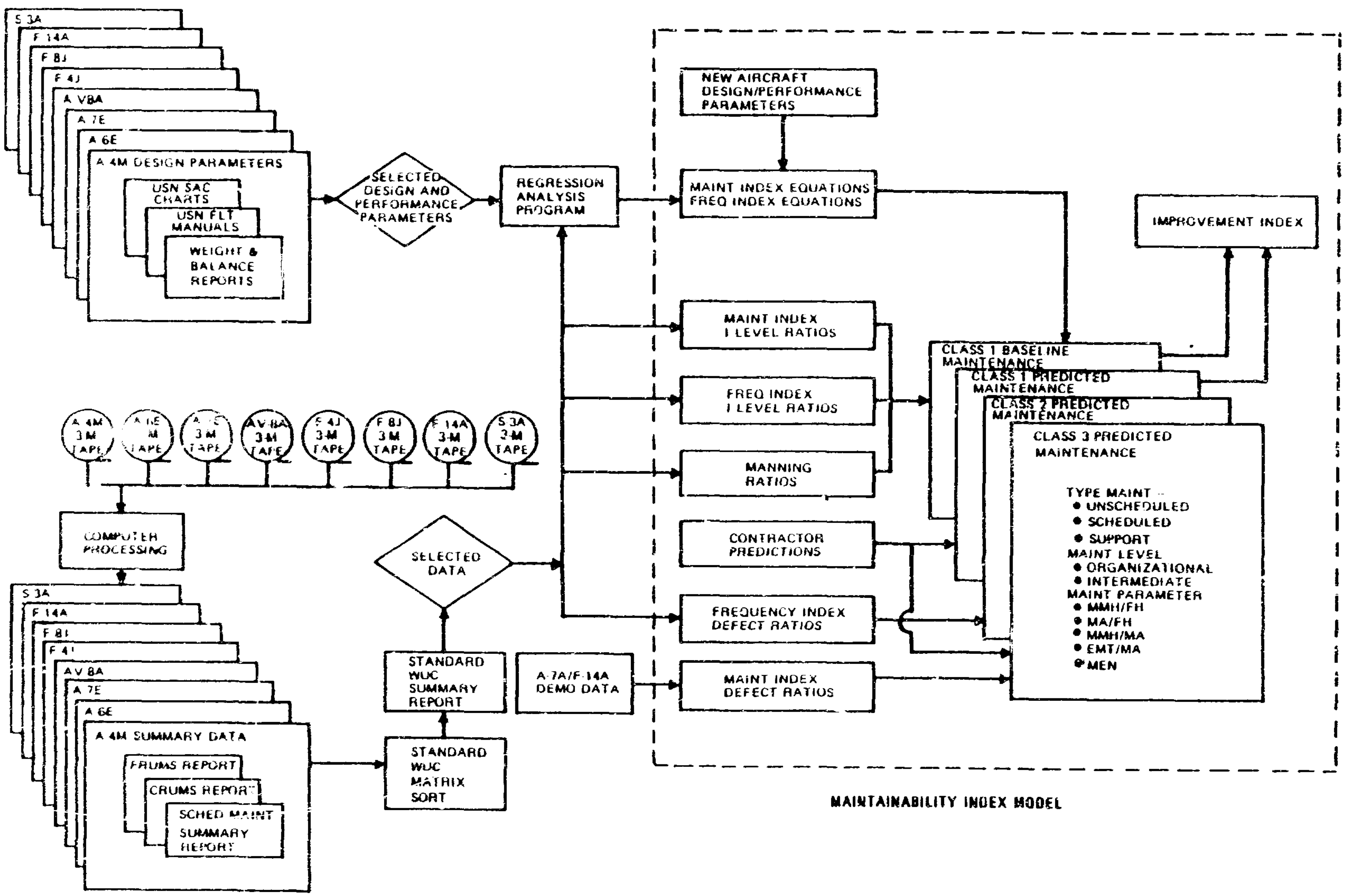

Figure 3.1 Navy Maintainability Index Model Logic Flow Diagram

aircraft range from 10,400 pounds to 38,200 pounds; the maximum speed ranges from 400 to 1300 knots and thrust ranges from 11,200 pounds to 41,800 pounds. Selected aircraft are evenly distributed with respect to crew size (four single-seat, three two-seat and one four-seat) and number of engines (four single-engine and four twin engine).

Table 3.1 presents a list of those parameters that were found to be most representative of an aircraft's design characteristics and were proven to be statistically valid. Values shown were extracted from the following documents:

- USN Standard Aircraft Characteristics Charts
- Weight and Balance Reports generated by each contractor

Other aircraft parameters that were considered, but rejected by the regression analysis program because of poor correlation include:

- Weight, Environment Control System (ECS)
- Weight, Engine
- Speed, Minimum Landing
- Thrust per Aircraft
- Number of Fuel Tanks
- Fuselage Volume
- Service Ceiling
- Maximum Payload
- Utilization Rate
- Weight, Useful Load

3.2.2 Two-Digit Work Unit Code (WUC) Data Base

A 4 to 12 month FMSO data base was selected for use in the system analysis. Raw 3-M data tapes obtained from FMSO were processed by computer programs into four output reports: three concerning unscheduled maintenance and one concerning scheduled maintenance. Each of the three unscheduled reports identified one of the three classes of maintenance established in the previous section, paragraph 2.3. The scheduled report identified scheduled maintenance for the three classes of maintenance in one report.

- <u>FRUMS Report</u>. The Fleet Reported Unscheduled Maintenance Summary (FRUMS) Report depicted Class 1 maintenance. It identified historical maintenance data as reported in an operational environment.

- <u>CRUMS Report</u>. The Contractor Responsible Unscheduled Maintenance Summary (CRUMS) Report was derived from the FRUMS Report with Navy responsible malfunctions (Table 2.2) deleted. CRUMS data depicted Class 2 maintenance.

- <u>CCUMS Report</u>. The Contractor Controllable Unscheduled Maintenance Summary (CCUMS) Report was derived from the CRUMS Report with Navy controllable maintenance time (Figure 2.4) deleted. CCUMS data depicted Class 3 maintenance.

- <u>SCHED Report</u>. The Scheduled Maintenance Summary Report was derived from the raw 3-M data tapes. It identified scheduled maintenance and support by all three classes of maintenance.

Table 3.1 Design Characteristics – Navy Fighter/Attack/ASW Aircraft

AIRCRAFT PARAMETER	SYMBOL	UNITS	A-4M	A-6E	A-7E	AV-8A	F-4J	F-8J	F-14A	S-3A
AREA, FUSELAGE WETTED	FUSWET	10^3 FT^2	0.487	1.006	0.749	0.541	0.913	0.861	1.647	1.004
AREA, WING	WAREA	10^3 FT^2	0.260	0.529	0.375	0.201	0.530	0.375	0.565	0.598
AUXILIARY POWER UNIT *	KAPU	1	1	0	0	1	0	0	0	1
BOUNDARY LAYER CONTROL *	KBLC	1	0	0	0	0	1	1	0	0
CREW SIZE	CREW	1	1	2	1	1	2	1	2	4
DENSITY	DEN	1 LB/FT^3	17.45	18.05	19.89	17.91	21.56	18.62	11.43	14.94
DRAG CHUTE *	KCHUTE	1	1	0	0	0	1	0	0	0
FUEL CAPACITY, INTERNAL	FUEL	10^3 GAL	0.800	2.344	1.476	0.758	1.998	1.348	2.362	1.933
GENERATOR ELECTRICAL POWER	GENKVA	10^2 KVA	0.200	0.600	0.250	0.120	0.600	0.250	1.200	1.500
GUN FACTOR *	KGUN	1	1	0	1	1	0	1	1	0
KINETIC ENERGY (WTLAND X VMIN^2)	KE	10^9 LB KN^2	0.209	0.347	0.408	NA	0.656	0.380	0.664	0.260
LENGTH, FUSELAGE	FUSLEN	10^2 FT	0.413	0.547	0.461	0.455	0.581	0.545	0.619	0.533
NUMBER OF ENGINES	ENGQTY	1	1	2	1	1	2	1	2	2
NUMBER OF PYLONS	PYLQTY	1	5	5	8	5	9	4	6	2
SORTIE LENGTH	SL	1 HR	1.55	1.83	1.73	1.05	1.38	1.36	1.56	2.68
SPEED, MAX AT ALTITUDE	VMAX	10^3 KN	0.537	0.490	0.506	0.525	1.230	0.989	1.314	0.410
SPEED, MIN CARRIER APPROACH	VMIN	10^3 KN	0.130	0.110	0.139		0.136	0.130	0.122	0.095
THRUST PER ENGINE	THRUST	10^3 LB	11.2	9.3	15.0	20.9	17.9	19.6	20.9	9.275
THRUST/WEIGHT RATIO	T/W	1	1.076	0.715	0.793	1.741	1.162	0.990	1.094	0.697
VOLUME, FUSELAGE	FUSVOL	10^3 FT	0.596	1.440	0.950	0.670	1.428	1.063	3.340	1.760
WEIGHT, AVIONICS INSTALLED	WTAVIN	10^3 LB	0.612	2.329	1.347	0.590	2.641	0.819	3.039	4.223
WEIGHT, AVIONICS UNINSTALLED	WTAVUN	10^3 LB	0.517	1.920	1.185	0.450	1.669	0.711	2.422	3.240
WEIGHT, COMBAT	WTCOM	10^3 LB	17.6	45.5	25.9	19.5	41.7	26.8	49.5	38.2
WEIGHT, EMPTY	WTMT	10^3 LB	10.4	26.0	18.9	12.0	30.8	19.8	38.2	26.6
WEIGHT, LANDING CLEAN	WTLAND	10^3 LB	12.4	28.7	21.1	13.0	35.5	22.5	44.6	28.9
WEIGHT, MAX TAKEOFF	WTMXTO	10^3 LB	24.5	60.4	42.0	24.6	56.0	34.0	72.5	52.5
WING SWEEP *	KWING	1	0	0	0	0	0	0	1	0

* 1 IF APPLICABLE, 0 IF NOT

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Data from these reports were put into a Standard WUC Matrix (Appendix B) and programmed into a Standard WUC Summary Report (Appendix A). Identification of the time frame for the FMSO data base by type aircraft and corresponding flight hours is presented in Table 3.2.

TABLE 3.2 MIM DATA BASE

AIRCRAFT	TIME PERIOD	MONTHS	FLT HRS
A-4M	DEC 75 - MAR 76	4	7,160
A-6E	DEC 75 - MAR 76	4	19,802
A-7E	JAN 75 - DEC 75	12	106,225
AV-8A	DEC 75 - MAR 76	4	5,944
F-4J	DEC 75 - MAR 76	4	26,238
F-8J	JAN 73 - AUG 73	8	14,087
F-14A	DEC 75 - APR 76	5	12,133
S-3A	JAN 75 - DEC 75	12	22,820

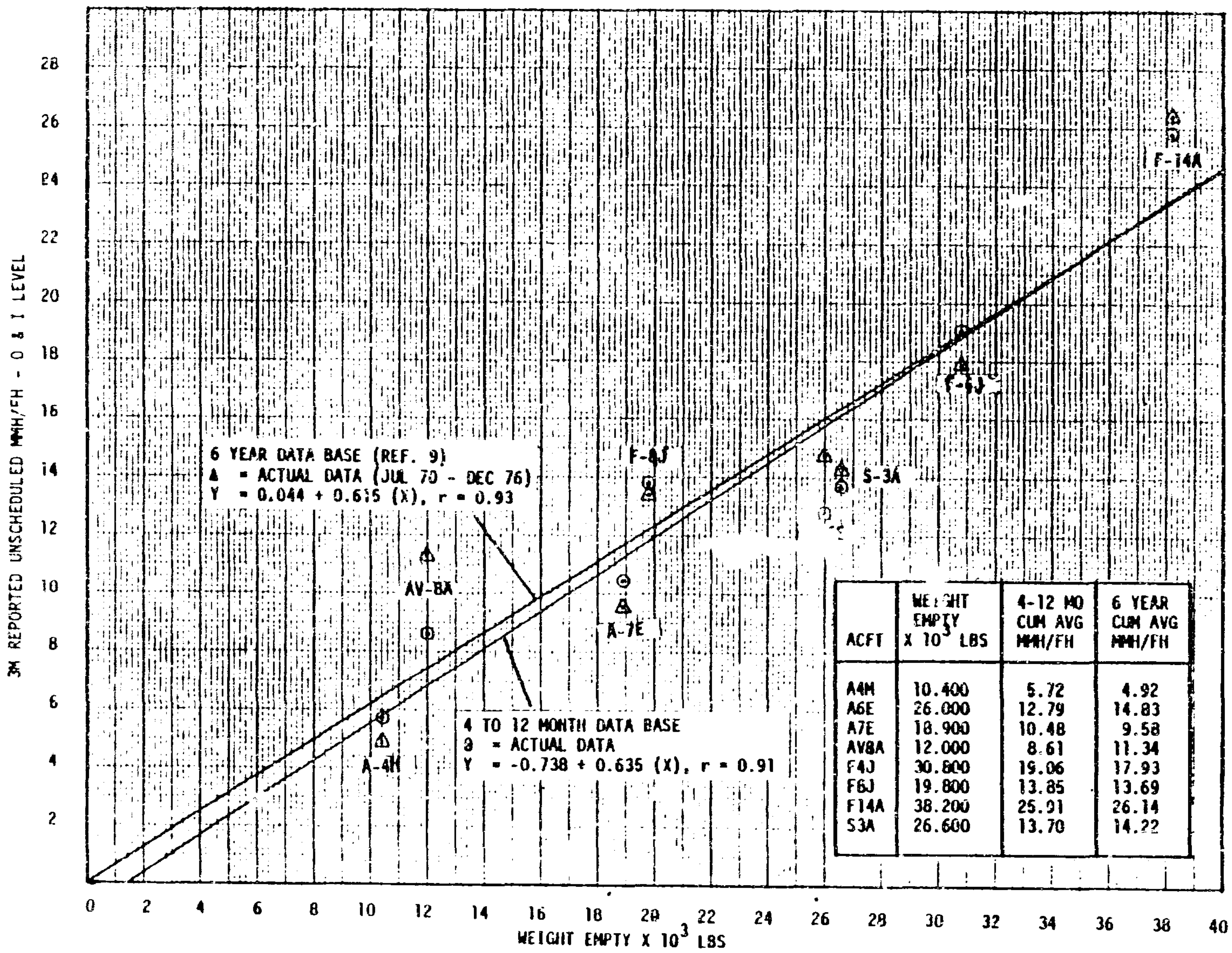
Selection of the two-digit WUC data base differed from the five-digit WUC data base because of data availability. The 4 to 12 month data base was readily available at the start of this Handbook from a previous Vought Research and Development study. Acquisition of a more current and larger data base was originally planned but had to be rejected in order to insure completion of this Handbook in a timely manner.

To verify that the 4 to 12 month data base was representative of mature aircraft in an operational environment, a correlation test was performed which compared sample data with a larger six year data base (Table E-1 of Appendix E). The test was made using total weapon system unscheduled MMH/FH (WUC 11-97) as a function of empty weight, one of the primary aircraft parameters that effects maintenance. Results indicate that the 4 to 12 month data base was representative of a six year data base when taken collectively over the eight aircraft. Figure 3.2 shows the results of this correlation.

A slightly lower degree of confidence existed at the system level where more pronounced variations in system maintenance occur as a function of time. However, the RFP requirements are made at the total weapon system level and not at each two-digit WUC. Accuracy of system level predictions need not be exact as long as the predictions are in the "ballpark" and their summation results in realistic weapon system estimates. The 4 to 12 month FMSO data base used provided this required accuracy.

3.2.3 Standard Work Unit Codes

Individual aircraft WUC's were converted to a Standard WUC format based on guidelines presented in MIL-STD-780 (Reference 14) and NAILSC Equipment Cross-Index Program (ECIP), (Reference 12). This was necessary to insure an adequate two-digit system level comparison among the different aircraft. An example of the variation in aircraft WUC systems is the Fuel Quantity Indicating Subsystem. The A-4M, A-7E, and F-4J list the Fuel Quantity Indicating Subsystem in the Fuel System (WUC 46), while the A-6E, AV-8A, F-14A and S-3A list it under Instruments



ACFT	WEIGHT EMPTY X 10^3 LBS	4-12 MO CUM AVG MMH/FH	6 YEAR CUM AVG MMH/FH
A4M	10.400	5.72	4.92
A6E	26.000	12.79	14.83
A7E	18.900	10.48	9.58
AV8A	12.000	8.61	11.34
F4J	30.800	19.06	17.93
F6J	19.800	13.85	13.69
F14A	38.200	25.91	26.14
S3A	26.600	13.70	14.22

FIGURE 3.2 DATA BASE CORRELATION

(WUC 51). Furthermore, MIL-STD-780 lists fuel quantity under WUC 51 while ECIP lists it under WUC 46. Differences such as these are resolved by using MIL-STD-780 as preferred. Appendix B presents a Standard WUC Matrix developed specifically for this Handbook. Standard WUC's are presented to the third digit for the eight Navy aircraft discussed in the system analysis.

The establishment of standard codes for support actions was based on Support Action Codes defined in Reference 18. A further breakdown of these basic codes to the third digit was made using a local command bulletin (Reference 31). A review of the 3-M data indicates most commands are using this bulletin to identify manhours expended in these specific categories of support type work. All total, forty-five work unit and support action codes[1] were condensed into thirty-two standard codes[2]. Condensed groupings were necessary to permit a valid statistical analysis of the data.

3.3 MAINTENANCE INDEX ESTIMATING RELATIONSHIPS

The MIM uses a set of estimating relationships called Maintenance Index (MI) equations developed through regression analysis techniques. These equations are used to determine system Class 1 Organizational level MMH/FH as a function of applicable aircraft design and performance parameters.

A statistical ranking order was used to identify those aircraft parameters that reflect the highest coefficient of correlation and the lowest Standard Error of Estimate(S) (References 5, 10). Parameters were selected based on several factors: (1) the most statistically valid parameter, (2) the most valid aircraft parameter and (3) the selection of two parameters for multiple regression. This approach resulted in a set of equations which provided good correlation with actual data. An example of the statistical approach for determining MI equations is presented in the following paragraph.

3.3.1 Statistical Airframe/Fuselage Maintenance Manhours per Flight Hour (MMH/FH)

Statistical Airframe/Fuselage (WUC 11, 12) MMH/FH at the Organizational level is estimated by Equation (Eq.) 3.1. Data used in its derivation and equation results are shown in Table 3.3.

$$MI = -0.2180 + 0.5692 \ln (WTMT) - 0.8394 \ln (VMAX) \qquad \text{Eq. 3.1}$$

$$r = 0.97$$
$$S = 0.17$$
$$2S = \pm 0.34$$

1. 11, 12, 13, 14, 23, 24, 27, 29, 41, 42, 44, 45, 46, 47, 49, 51, 56, 57, 62, 63, 64, 65, 66, 67, 69, 71, 72, 73, 74, 75, 76, 77, 91, 93, 96, 97, 01, 02, 03, 04, 05, 06, 07, 08, 09.

2. 11/12, 13, 14, 23, 24, 29, 41, 42, 44, 45, 46, 47, 49, 51, 56, 57, 60, 71/72/73/74, 75, 76, 0, 01, 012, 016, 02, 03C, 03D, 03G, 03S, 03Z, 04, 05.

TABLE 3.3 AIRFRAME/FUSELAGE ACTUAL AND EQUATION MMH/FH

ACFT	WTMT	VMAX	MMH/FH	
			ACTUAL	EQUATION
A-4M	10.4	0.537	0.400	0.593
A-6E	26.0	0.490	1.011	1.037
A-7E	18.9	0.506	1.071	0.983
AV-8A	12.0	0.525	0.741	0.655
F-4J	30.8	1.230	2.075	1.907
F-8J	19.8	0.989	1.499	1.472
F-14A	38.2	1.314	1.902	2.084
S-3A	26.6	0.410	0.834	0.901

The following definitions are presented to provide additional insight into the nomenclature used:

- Maintenance Index (MI) is defined as the amount of MMH/FH for the given system as measured at the Organizational level.

- Weight Empty (WTMT) is one of the applicable aircraft parameters for this system as measured in thousands of pounds. Care should be taken when solving the MI equation insuring that the proper decimal point location is observed.

- Maximum Speed (VMAX) is the second applicable parameter for this system as measured in thousands of knots. Correct decimal point location must be observed when solving the MI equation.

- Correlation Coefficient (r) is defined as the relative measure of sensitivity between the dependent variable and the independent variable as measured from 0 to 1. The higher the coefficient, the closer "r" approaches 1, the better the data fit. Some systems required numerous regression programs to be run in order to achieve the highest "r" value possible. Values between 0.95 and 0.99 indicate a very high degree of correlation.

- Standard Error of Estimate (S) measures the average amount of "...dispersion of the Y...[values] away from the line of relationship between the X and Y...[variables]...[3]". The standard error also serves to measure the amount of error in an individual estimate. Assuming that errors conform to a normal distribution, 95% of the errors would fall within ± 2 standard errors of the predicted value. Thus a 95% confidence level can be found by using $\pm 2S$ which for this example is ± 0.34 MMH/FH.

Figure 3.3 presents a complete list of the system Maintenance Index equations developed for this Handbook. Aircraft parameter symbols listed are defined in Table 3.5. A graphical presentation of each MI equation is presented in Section 5.0.

The predicted value calculated by each MI equation is a "baseline" estimate based on the maintainability characteristics of existing inventory aircraft. For a new weapon system, a "predicted" estimate made by the contractor should be less than the "baseline" estimate depending on the additional maintainability features implemented in the design. The measurement of the delta improvement is discussed in paragraph 3.5.3.

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3. H. L. Balsley, Statistical Method, Littlefield, Adams and Co., p. 179.

STD WUC	SYSTEM	MAINTENANCE INDEX EQUATIONS
11, 12	AIRFRAME/FUSELAGE	MI = −0.2180 + 0.5692 ln (WTMT) + 0.8394 ln (VMAX)
13	LANDING GEAR	MI = 0.1738 + 0.0241 (WTLAND)
14	FLIGHT CONTROLS	MI = −0.3963 + 0.0274 (WTMT) + 0.8036 (VMAX) + 0.569 (KWING)
23	ENGINE	MI = −0.3960 + 0.0467 (THRUST) + 0.3414 (ENGQTY)
24	AUXILIARY POWER PLANT	MI = 0.192 (KAPU)
29	POWER PLANT INSTL	MI = −0.0943 + 0.0059 (THRUST) + 0.1174 (ENGQTY)
41	AIR-CONDITIONING	MI = −0.0717 + 0.0103 (WTMT) + 0.0364 (WTAVIN) + 0.166 (KBLC)
42	ELECTRICAL	MI = −0.1419 + 0.0259 (WTMT) −0.0485 (GENKVA)
44	LIGHTING	MI = −0.2305 + 0.1652 (WAREA) +0.6472 (FUSLEN)
45	HYDRAULICS	MI = −0.1260 + 0.0066 (WTMT) + 0.3671 (VMAX)
46	FUEL	MI = −0.2947 + 0.1148 (FUEL) + 0.6060 (VMAX)
47	OXYGEN	MI = 0.034
49	MISC UTILITIES	MI = −0.0275 + 0.0028 (WTMT)
51	INSTRUMENTS	MI = 0.0465 + 0.2906 (WTAVUN)
56	FLIGHT REFERENCE	MI = −0.0890 + 0.2182 (WTAVIN)
57	INTEG GUID/FLT CONTROL	MI = −0.3225 + 0.1783 ln (WTMT)
60	COMMUNICATIONS	MI = 0.0428 + 0.0104 (WTMT) + 0.0460 (WTAVIN)
71, 72	NAV/WEAPON CONTROL	MI = 1.3541 + 0.8715 ln (WTAVUN)
73, 74		
75	WEAPON DELIVERY	MI = −0.1563 + 0.0040 (WTMT) + 0.0367 (PYLQTY) + 0.082 (KGUN)
76	ECM	MI = −0.0645 + 0.0104 (WTMT)
90	MISC EQUIPMENTS	MI = 0.0272 −0.0012 (WTMXTO) + 0.0491 (CREW) + 0.014 (KCHUTE)
01	OPERATIONAL SUPPORT	MI = −7.9012 + 5.3533 ln (WTMT) − 1.9394 ln (SL)
012	SERVICING	MI = 1.3441 + 0.0046 (WTMT) − 0.2573 (SL)
016	TROUBLESHOOT LAUNCH AIRCRAFT	MI = −3.3681 + 1.3259 ln (WTCOM)
02	CLEANING	MI = 0.188
03C	TURNAROUND/PREFLIGHT	MI = −0.0282 + 0.0346 (WTCOM)
03D	DAILY/SPECIAL	MI = 2.3571 + 0.0948 (WTMT) − 1.1568 (SL)
03G	PHASE	MI = 0.1455 + 0.0186 (WTMT) + 0.2962 (T/W)
03S	CONDITIONAL	MI = −0.4956 + 0.0229 (WTMT) + 0.0224 (DEN)
03Z	OTHER	MI = −0.4068 + 0.3538 (FUSWET) + 0.5392 (T/W)
04	CORROSION PREVENTION	MI = −2.6456 + 2.6493 (FUSWET) + 1.5454 (T/W)
05	SHOP SUPPORT	MI = −0.3510 + 0.3613 ln (WTMT) + 0.4916 ln (T/W)

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Figure 3.3 Baseline 0 Level MMH/FH Estimating Relationships

3.4 FREQUENCY INDEX ESTIMATING RELATIONSHIPS

In addition to the MI equations previously discussed, the MIM uses a second set of estimating relationships called Frequency Index (FI) equations. These equations are used to determine system Class 1 MA/FH at the Organizational level as a function of applicable aircraft design and performance parameters. The same regression techniques used to develop MI equations were used to develop FI equations. An example of the statistical approach for determining a system Frequency Index follows.

3.4.1 Statistical Airframe/Fuselage Maintenance Actions per Flight Hour (MA/FH)

Statistical Airframe/Fuselage MA/FH at the Organizational level is estimated by Equation 3.2. Data used in its derivation and equation results are shown in Table 3.4.

$$FI = -0.2931 + 0.1600 \ln (WTMT) + 0.0525 \ln (VMAX) \qquad \text{Eq. 3.2}$$

$r = 0.971$

$S = 0.028$

$2S = \pm 0.056$

TABLE 3.4 AIRFRAME/FUSELAGE ACTUAL AND EQUATION MA/FH

ACFT	WTMT	VMAX	MA/FH	
			ACTUAL	EQUATION
A-4M	10.4	0.537	0.081	0.095
A-6E	28.0	0.490	0.233	0.200
A-7E	18.9	0.505	0.283	0.258
AV-8A	12.0	0.525	0.125	0.120
F-4J	30.8	1.230	0.341	0.335
F-8J	19.8	0.989	0.233	0.243
F-14A	38.2	1.314	0.371	0.377
S-3A	26.6	0.410	0.210	0.250

Figure 3.4 presents a complete list of the system Frequency Index equations. A graphical presentation of each FI equation is presented in Section 5.0. As with the Maintenance Index, the predicted value calculated by each FI equation is a "baseline" estimate.

STD WUC	SYSTEM	FREQUENCY INDEX EQUATIONS
11,12	AIRFRAME/FUSELAGE	FI = −0.2931 + 0.1800 ln (WTMT) − 0.0525 ln (VMAX)
13	LANDING GEAR	FI = 0.1019 + 0.1850 (KE)
14	FLIGHT CONTROLS	FI = 0.0112 + 0.1183 (VMAX) − 0.022 (KWING)
23	ENGINE	FI = −0.0194 − 0.0023 (THRUST) + 0.0340 (ENGQTY)
24	AUXILIARY POWER PLANT	FI = 0.037 (KAPU)
29	POWER PLANT INSTL	FI = −0.0069 + 0.0023 (THRUST) − 0.0028 (ENGQTY)
41	AIR-CONDITIONING	FI = 0.0019 + 0.0013 (WTMT) + 0.0072(WTAVIN) + 0.016 (KBLC)
42	ELECTRICAL	FI = −0.0100 + 0.0027 (WTMT) + 0.0092 (GENKVA)
44	LIGHTING	FI = −0.1458 −0.0333 (WAREA) + 0.4444 (FUSLEN)
45	HYDRAULICS	FI = 0.0191 + 0.0361 (VMAX)
46	FUEL	FI = 0.0056 + 0.0465 (VMAX)
47	OXYGEN	FI = 0.019
49	MISC UTILITIES	FI = −0.0036 + 0.0004 (WTMT)
51	INSTRUMENTS	FI = 0.0360 + 0.0467 (WTAVUN)
56	FLIGHT REFERENCE	FI = −0.0106 + 0.0483 (WTAVIN)
57	INTEG GUID/FLT CONTROL	FI = 0.0376 + 0.0201 ln (WTAVUN)
60	COMMUNICATIONS	FI = 0.0194 + 0.0037 (WTMT) + 0.0190 (WTAVIN)
71, 72 73,74	NAV/WEAPON CONTROL	FI = 0.3616 + 0.2379 LN (WTAVUN)
75	WEAPON DELIVERY	FI = −0.0087 + 0.0006 (WTMT) + 0.0034 (PYLQTY) + 0.017 (KGUN)
76	ECM	FI = −0.0049 + 0.0016 (WTMT)
90	MISC EQUIPMENTS	FI = −0.0057 −0.0003 (WTMXTO) + 0.0267 (CREW) + 0.007 (KCHUTE)
01	OPERATIONAL SUPPORT	FI = 1.8159 + 1.5686 (FUSWET) + 0.4695 (SL)
012	SERVICING	FI = 1.2895 − 0.4381 ln (SL) + 0.2970 ln (VMAX)
016	TROUBLESHOOT LAUNCH AIRCRAFT	FI = −0.0378 + 0.1339 (WTAVIN) + 0.4677 (T/W)
02	CLEANING	FI = 0.097
03C	TURNAROUND/PREFLIGHT	FI = 0.5305 + 0.0208 (WTMT) − 0.1358 (SL)
03D	DAILY/SPECIAL	FI = −0.5132 + 0.7166 (FUSWET) + 0.7052 (T/W)
03G	PHASE	FI = 0.025
03S	CONDITIONAL	FI = −0.3111 + 0.0561 LN (WTMT) + 0.0701 LN (DEN)
03Z	OTHER	FI = −0.0760 + 0.0245 (T/W) + 0.0074 (DEN)
04	CORROSION PREVENTION	FI = 0.3948 + 0.3130 ln (FUSWET)
05	SHOP SUPPORT	FI = −0.0316 + 0.0131 (WTMT) + 0.1675 (T/W)

Figure 3.4 Baseline 0 Level MA/FH Estimating Relationships

3.5 MODEL OPERATION

The Maintainability Index Model (MIM) is a mathematical tool for estimating maintenance requirements for a new weapon system. Execution of the MIM is accomplished by solving a set of index equations and general mathematical relationships. Inputs include applicable aircraft design characteristics, system constants and contractor predictions. Outputs include MMH/FH, MA/FH, MMH/MA, EMT/MA at O and I levels for a 3-M (Class 1) and FSE (Class 3) environment. A logic flow diagram depicting the operation of the MIM is shown in Figure 3.1. A discussion on model operation follows.

3.5.1 Aircraft Design and Performance Parameters

As the physical size, performance and capability of a weapon system varies, so does its maintenance requirements. The MIM is built around a set of 27 aircraft parameters that were determined to be the primary design characteristics that effect aircraft maintenance. In addition, values for these parameters are readily available during conceptual and development design phases. Table 3.5 presents a list of those parameters along with F-18A predicted values used as an example.

Table 3.5 Aircraft Parameters

SYMBOL	AIRCRAFT PARAMETERS	F-18A EXAMPLE
FUSWET	Area, Fuselage Wetted – 10^3 feet^2	0.840
WAREA	Area, Wing – 10^3 feet^2	0.390
KAPU	Auxiliary Power Unit Factor*	1
KBLC	Boundary Layer Control Factor*	0
CREW	Crew Size	1
DEN	Density (WTMT ÷ FUSVOL) – lb/feet^3	18.510
KCHUTE	Drag Chute Factor*	0
FUEL	Fuel Capacity, Internal – 10^3 gal.	1.615
GENKVA	Generator Electrical Power – 10^2 KVA	0.80
KGUN	Gun Factor*	1
KE	Kinetic Energy (WTLAND × VMIN^2) – 10^9 lb-knots^2	0.348
FUSLEN	Length, Fuselage – 10^2 feet	0.56
ENGQTY	Number of Engines	2
PYLQTY	Number of Pylons	9
SL	Sortie Length – hr	1.35
VMAX	Speed, Maximum at Altitude – 10^3 knots	1.085
VMIN	Speed, Minimum Carrier Approach – 10^3 knots	0.130
THRUST	Thrust per Engine – 10^3 lb	16.000
T/W	Thrust/Weight Ratio	1.555
FUSVOL	Volume, Fuselage – 10^3 feet^3	1.112
WTAVIN	Weight, Avionics Installed – 10^3 lb	1.293
WTAVUN	Weight, Avionics Uninstalled – 10^3 lb	1.060
WTCOM	Weight, Combat – 10^3 lb	33.600
WTMT	Weight, Empty – 10^3 lb	20.593
WTLAND	Weight, Landing Clean – 10^3 lb	23.083
WTMXTO	Weight, Maximum Takeoff – 10^3 lb	50.064
KWING	Wing Sweep Factor*	0

*1 IF APPLICABLE, 0 IF NOT

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The first step in analyzing the maintenance requirements of a weapon system is to complete a worksheet for the weapon system under consideration, similar to Table 3.5, using the aircraft parameters cited therein. After that, maintenance estimates (baseline and predicted) for each system can be determined using techniques presented in Section 5.0.

3.5.2 System Constants

Class 1 O-level MMH/FH and MA/FH are the two maintainability parameters determined through regression analysis techniques. The remaining parameters are calculated using general mathematical relationships and system constants where regression analysis techniques were considered but rejected because of invalid correlation results and to minimize handbook complexity.

System constants are averages based on historical maintenance data concerning past performance. "...The assumption is made that the elemental activities for a new system will closely resemble the systems for which data was collected"[4]. That is, if a given system averages 1.5 Men per Maintenance Action, then the same number of men will be required for the new system. Exceptions require maintainability documentation. Definitions of system constants plus sample calculations follow.

Manning Ratio (MR) is defined as the average number of men required per unscheduled maintenance action. For each system, a Class 1 MR is determined by averaging individual aircraft Class 1 MEN per Equation 3.3.

$$MR = \frac{\sum_{i=1}^{n} MEN_i}{n} \qquad \text{Eq. 3.3}$$

where,

MR = Average number of men per maintenance action per given system
MEN = Average number of men per maintenance action per aircraft
n = Number of aircraft used in the regression analysis
i = 1, 2, 3.....n

Class 1 MR is used in the MIM to determine EMT/MA for a new aircraft as shown by Equation 3.4

$$EMT/MA = MMH/MA \div MR \qquad \text{Eq. 3.4}$$

Maintenance Index I-Level Ratio (MIIR) is defined as the ratio of I-level MMH/FH to O-level MMH/FH. Individual aircraft MIIR's are summed and averaged as shown in Equation 3.5.

$$MIIR = \frac{\sum_{i=1}^{n} \left(\frac{MMH/FH_I}{MMH/FH_O}\right)_i}{n} \qquad \text{Eq. 3.5}$$

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4. D. D. Gregor, Donna F. Harmon, Patricia A. Pate, "Maintainability Estimating Relationships", p.20.

where,

MMH/FH_O = MMH/FH at O level
MMH/FH_I = MMH/FH at I level

Using the Airframe/Fuselage System (Table 3.6) as an example, Class 1 MIIR was calculated as follows:

$$MIIR_{11,12} = \frac{\left(\frac{MMH/FH_I}{MMH/FH_O}\right)_{A\text{-}4M} + \left(\frac{MMH/FH_I}{MMH/FH_O}\right)_{A\text{-}6E} + \left(\frac{MMH/FH_I}{MMH/FH_O}\right)_{A\text{-}7E} + \ldots + \left(\frac{MMH/FH_I}{MMH/FH_O}\right)_{S\text{-}3A}}{n}$$

$$= \frac{\frac{0.022}{0.400} + \frac{0.043}{1.011} + \frac{0.151}{1.071} + \ldots + \frac{0.050}{0.834}}{8}$$

$$= \frac{0.055 + 0.042 + 0.141 + \ldots + 0.060}{8}$$

$$= 0.04$$

Class 1 MIIR is used in the MIM to determine I-level MMH/FH for a new system design as shown by Equation 3.6.

$$MMH/FH_I = MMH/FH_O \times MIIR \qquad \text{Eq. 3.6}$$

Frequency Index I Level Ratio (FIIR) is defined as the ratio of I-level MA/FH to O-level MA/FH. Individual FIIR's for each aircraft are summed and averaged per Equation 3.7.

$$FIIR = \frac{\sum_{i=1}^{n} \left(\frac{MA/FH_I}{MA/FI_O}\right)_i}{n} \qquad \text{Eq. 3.7}$$

Using the Airframe/Fuselage System as an example, Class 1 FIIR was calculated to be 0.07.

Class 1 FIIR is used in the MIM to determine I-level MA/FH for a new system using Equation 3.8.

$$MA/FH_I = MA/FH_O \times FIIR \qquad \text{Eq. 3.8}$$

TABLE 3.6 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 11, 12 SYSTEM: Airframe and Fuselage

ACFT	CLASS 1 MAINTENANCE - 3M										
	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
A4M	.400	.081	4.94	2.73	1.8	.022	.005	4.40	3.43	1.3	.422
A6E	1.011	.283	3.56	1.93	1.9	.043	.006	7.13	4.78	1.5	1.054
A-7E	1.071	.233	4.60	2.36	2.0	.151	.007	21.57	13.02	1.7	1.222
AV8A	.741	.125	5.93	3.53	1.7	.005	.003	1.68	0.93	1.7	.746
F4J	2.075	.341	6.09	3.43	1.8	.044	.006	7.33	4.12	1.8	2.119
F8J	1.499	.233	6.43	3.04	2.1	.086	.015	5.73	5.35	1.1	1.585
F14A	1.902	.371	5.13	2.48	2.1	.221	.014	15.79	9.86	1.6	2.123
S3A	.834	.210	3.97	2.14	1.8	.050	.011	4.55	3.13	1.5	.884
	CLASS 3 MAINTENANCE - DESIGN EQUIVALENT										
A4M	.203	.054	3.76	1.90	2.0	.015	.005	3.13	2.48	1.3	.219
A6E	.554	.226	2.45	1.29	1.9	.028	.006	4.63	3.37	1.4	.581
A7E	.625	.200	3.13	1.49	2.1	.092	.006	15.32	9.88	1.6	.718
AV8A	.424	.100	4.24	2.33	1.8	.004	.003	1.35	0.80	1.7	.428
F4J	1.161	.284	4.09	2.15	1.9	.028	.006	4.76	2.35	2.0	1.190
F8J	.871	.204	4.27	1.88	2.3	.055	.014	3.94	3.08	1.3	.926
F14A	.951	.273	3.48	1.10	2.2	.120	.013	9.23	6.35	1.5	1.071
S3A	.424	.165	2.55	1.35	1.9	.034	.011	3.06	2.21	1.4	.457

Maintenance Index Defect Ratio (MIDR) is defined as the ratio of Class 3 O-level MMH/FH to Class 1 O-level MMH/FH. It identifies that portion of Class 1 maintenance considered contractor controllable through design. A MIDR is determined for each system by summing and averaging the individual aircraft MIDR's per Equation 3.9.

$$\mathrm{MIDR} = \frac{\sum_{i=1}^{n} \left(\frac{\text{Class 3 O-Level MMH/FH}}{\text{Class 1 O-Level MMH/FH}} \right)_i}{n} \qquad \text{Eq. 3.9}$$

Using the Airframe/Fuselage System (Table 3.6) as an example, MIDR was calculated as follows:

$$\mathrm{MIDR}_{11,12} = \frac{\left(\frac{\mathrm{MMH/FH}_{3,0}}{\mathrm{MMH/FH}_{1,0}}\right)_{A-4M} + \left(\frac{\mathrm{MMH/FH}_{3,0}}{\mathrm{MMH/FH}_{1,0}}\right)_{A-6E} + \ldots + \left(\frac{\mathrm{MMH/FH}_{3,0}}{\mathrm{MMH/FH}_{1,0}}\right)_{S-3A}}{n}$$

$$= \frac{\frac{0.200}{0.400} + \frac{0.524}{1.011} + \ldots + \frac{0.374}{0.834}}{8}$$

$$= \frac{0.50 + 0.52 + \ldots + 0.45}{8}$$

$$= 0.54$$

The MIDR is used to determine the Design Maintenance Index scale for the MI graphs of Section 5.0.

Frequency Index Defect Ratio (FIDR) is defined as the ratio of Class 3 O-level MA/FH to Class 1 O-level MA/FH. It identifies that portion of Class 1 maintenance actions classified as Design Induced Malfunctions. A FIDR is determined for each system by summing and averaging individual aircraft FIDR's per Equation 3.10.

$$\mathrm{FIDR} = \frac{\sum_{i=1}^{n} \left(\frac{\text{Class 3 O-Level MA/FH}}{\text{Class 1 O-Level MA/FH}} \right)_i}{n} \qquad \text{Eq. 3.10}$$

Using the Airframe/Fuselage System as an example, FIDR was calculated to be 0.79. This means that 79% of the reported 3-M data is considered contractor controllable through design. The remaining 21% is primarily attributed to no defect, cannibalization and missing fastener maintenance actions and is considered Navy controllable. The FIDR is used to determine the design Frequency Index scale for the FI graphs of Section 5.0.

3.5.3 Technology Improvement Index

"Maintainability estimating techniques must be responsive to design technology advancements as well as design parameters and historical maintenance data"[5]. The MIM calculates baseline maintenance requirements reflecting state-of-the-art technology and its corresponding R&M effort. The model is also receptive to advances in design technology. Inherently, an increase in aircraft performance results in an increase in maintenance requirements. To minimize or reverse this trend, greater emphasis must be placed on R&M through technology improvements. This relationship is shown in Figure 3.5.

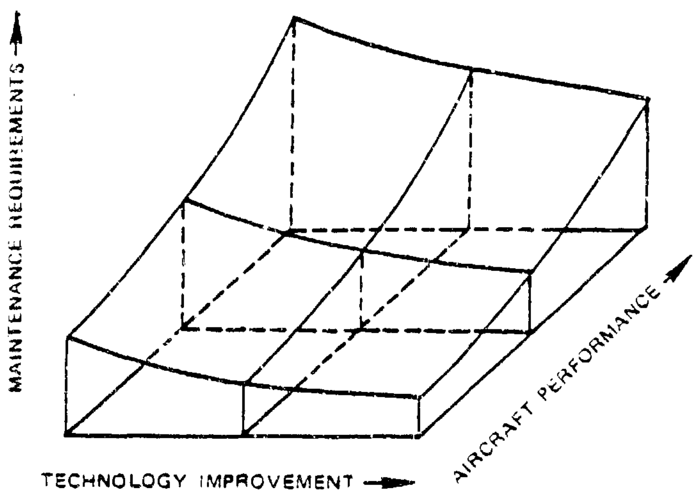

Figure 3.5 Maintenance Requirements (Ref. 10)

Engineering improvements which reduce maintenance resources and frequency of maintenance in a new design are measured by the Technology Index (TI). Using data from the MIM and predictions made by the contractor, a Technology Index can be calculated for each system per Equation 3.11.

$$TI = \left| \frac{BMMH/FH - PMMH/FH}{BMMH/FH} \right| \times 100\% \qquad \text{Eq. 3.11}$$

where,

TI = Technology Improvement Index
PMMH/FH = Predicted MMH/FH
BMMH/FH = Baseline MMH/FH

5. Idem., p.23.

Using the Airframe/Fuselage System as an example, Class 1 O-level MMH/FH Technology Index for the F-18A was found to be 53%.

$$TI = \left| \frac{1.572 - 0.746}{1.572} \right| \times 100\% = 53\%$$

where 0.746 is the 3-M equivalent MMH/FH of the contractor's predicted 0.403 value. (Refer to Section 5.0, paragraph 5.1.3 for additional information.) This indicates that the contractor predicts the F-18A Airframe/Fuselage System to be 53% better than a comparable state-of-the-art design. Substantiating documentation for achieving this prediction should be presented through qualitative maintainability features in the contractor's proposal.

Technology Indexes for MA/FH, EMT/MA and MMH/MA are determined in similar fashion and are discussed in Section 5.0, paragraph 5.1.3.

3.6 MODEL VALIDATION

The purpose of the MIM is to determine the maintenance requirements for a given sized aircraft as a function of design. The model was designed to be independent of system maintenance peculiarities unique to a given aircraft. Ground rules for a system regression analysis permitted excluding those aircraft which exhibited abnormal maintenance. If a satisfactory regression analysis could not be obtained using all eight aircraft, those aircraft in the minority were deleted from the system analysis. To include them would have distorted the trend for a majority of the aircraft, lowered system regression correlation and decreased the effectiveness of the model. The relationship between design and maintenance would be degraded.

An effort was made to determine why certain aircraft exhibited higher or lower reported maintenance than the resultant calculated value. These findings are noted in Section 5.0 when available. Unfortunately, not all cases could be resolved because of insufficient data.

Validation of the MIM was made at both the system and weapon system level using the parameters MMH/FH, MA/FH and EMT/MA. Individual system validation is presented in Section 5.0 by two-digit WUC. Most all systems exhibited correlation coefficients in the high 90's indicating excellent data correlation. Total weapon system validation is shown in Table 3.7 and Figure 3.6. Results show good correlation between actual and calculated data with the model slightly under predicting baseline aircraft maintenance.

TABLE 3.7 MODEL VALIDATION - CLASS 1 MAINTENANCE

AIRCRAFT	TOTAL MMH/FH		UNSCHEDULED O-LEVEL					
			MMH/FH		MA/FH		EMT/MA	
	ACT	CAL	ACT	CAL	ACT	CAL	ACT	CAL
A-4M	14.8	14.6	4.1	4.2	1.0	1.0	2.1	2.1
A-6E	29.7	30.2	8.5	9.1	2.0	1.9	2.2	2.4
A-7E	25.0	23.2	7.2	7.0	1.6	1.5	2.2	2.3
AV-8A	23.1	20.1	6.4	4.8	1.4	1.1	2.4	2.2
F-4J	40.7	38.3	14.2	12.6	2.4	2.3	3.0	2.7
F-8J	35.3	26.4	10.4	8.1	2.0	1.5	2.6	2.6
F-14A	52.2	45.7	18.2	15.1	2.9	2.7	2.6	2.9
S-3A	28.0	30.5	9.8	10.4	2.5	2.3	2.2	2.3

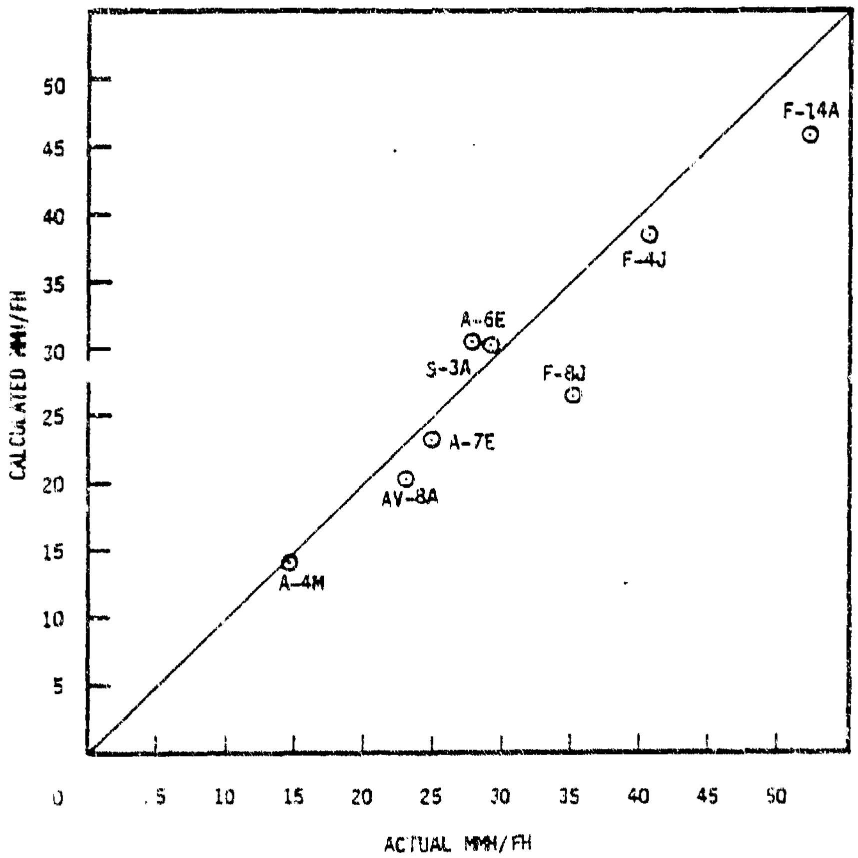

FIGURE 3.6 MODEL VALIDATION - CLASS 1 TOTAL AIRCRAFT MMH/FH

5.0 SYSTEM ANALYSIS

This section of the Handbook presents the methodology and techniques used to evaluate a contractor's quantitative maintainability predictions at the two-digit WUC level. In addition, the user can apply these techniques to establish system goals and total weapon system requirements by specifying desired design technology improvements.

The Handbook is arranged numerically with Standard Work Unit Codes 11-90 identifying aircraft systems and Standard Support Action Codes 01-05 identifying support action tasks. For the sake of continuity, the term system is defined to include support action tasks and the term WUC is defined to include Support Action Codes.

The methodology used to evaluate the maintenance requirements of a new weapon system encompasses using historical data, regression analysis techniques, graphical techniques, contractor predictions and an evaluation worksheet. For each system, a series of tables and figures consistent in title and numbering are presented. To aid in understanding the methodology presented, the F-18A contractor predictions (Reference 8) are included as an example. Where F-18A predictions are not available (i.e. support actions), baseline values are shown. A brief discussion on the content of the tables, graphs and worksheet follows. Refer to the Airframe/Fuselage System, paragraph 5.1, for sample formats and a more detailed explanation.

o TWO-DIGIT WUC MAINTENANCE DATA SUMMARY (TABLE 5.1-1)

This table contains historical maintenance data extracted from Appendix A and used in the system analysis. Data is broken down into two classes of maintenance and two levels of maintenance for five parameters. All total, 22 quantitative values are shown which describe the basic maintenance requirements of these aircraft. When the two-digit evaluation for a new system is completed, the information provided in this section will enable its user to generate a similar set of values.

o REGRESSION ANALYSIS SUMMARY (TABLE 5.1-2)

This table summarizes the results of a regression analysis program used to correlate aircraft design and performance characteristics with historical maintenance data. For each system, or group of systems, one or two applicable design/performance parameters were correlated with Class 1 O-level MMH/FH (Maintenance Index). A similar treatment was performed for Class 1 O-level MA/FH (Frequency Index). Statistical parameter results are included for each index equation.

o SYSTEM MAINTENANCE INDEX GRAPH (FIGURE 5.1-1)

The Maintenance Index (MI) graph shows the relationship between baseline and predicted O-level MMH/FH requirements for a given design. The baseline curve was developed from the regression equation presented in Table 5.1-2 using graphical techniques. The advantage of the graph is that it converts an abstract equation into an easy to understand visual picture. The sensitivity of system maintenance is shown as a function of aircraft speed, weight, thrust, etc. Each graph has two MMH/FH scales. The upper scale called Design MI identifies Class 3 maintenance. The lower scale called 3-M MI identifies Class 1 maintenance. Conversion between the two scales is determined through the Maintenance Index Defect Ratio which is unique for each system. Solution of the graph enables the user to (1) identify the minimum acceptable maintenance expenditure for the given design as measured in an operational environment, (2) convert contractor predicted MMH/FH to a 3-M equivalent and (3) identify the predicted improvement or degradation over a baseline design. See paragraph 5.1.1 for a more detailed explanation on the procedure for evaluating a system Maintenance Index.

o SYSTEM FREQUENCY INDEX GRAPH (FIGURE 5.1-2)

This illustration is similar to the Maintenance Index graph except MA/FH is plotted instead of MMH/FH. See paragraph 5.1.2 for details.

o WORKSHEET FOR EVALUATING SYSTEM MAINTENANCE REQUIREMENTS (FIGURE 5.1-3)

This worksheet is used in evaluating system quantitative maintenance estimates for a new design. To simplify use of the worksheet, it is divided into three parts. Part I calls for RFP response data. From the contractor's maintainability proposal, the user must extract predicted MMH/FH, MA/FH (or MFHBMA) and EMT/MA estimates by two-digit WUC at O and I levels. In addition, design/performance parameters applicable to each system are required. To simplify this task, the user may request the contractor submit a list of design/performance parameters (Table 3.5) in his maintainability proposal volume. Part II identifies system constants applicable to each system. Baseline constants were determined from the system historical data base. Predicted constants must be determined using contractor estimates.

Part III of the worksheet presents the system analysis evaluation procedure. The methodology shows how each maintenance parameter can be calculated for baseline and predicted criteria plus identification of technology improvement factors. Full or partial completion of this part of the worksheet is left to the discretion of the Handbook user. All, or just a few parameters can be calculated depending on the depth of analysis required. See paragraph 5.1.3 for a more detailed procedure on the calculation of system maintenance requirements. The net output from this worksheet will answer the following questions:

1. Are the contractor's estimates in the "ballpark"?
2. How much maintainability improvement, in percent, is the contractor predicting?
3. Do qualitative maintainability features presented in the contractor's proposal substantiate these estimates?

5.22 OPERATIONAL SUPPORT - WUC 01

Selected Parameters: Weight empty, sortie length, and fuselage wetted area.

Number of Regression Equations Run: 7

Parameters Considered and Rejected: Weight combat and weight maximum takeoff.

Comments: Support Action Code 01 accounts for the largest expenditure of reported aircraft maintenance. Approximately 70% of Class 1 Support MMH/FH and 27% of Class 1 Total Aircraft MMH/FH is reported against this code. Operational support is generally considered a Navy responsible task because of the numerous routine and repetitive sub-tasks performed under code 01. OPNAVINST 4790.2A (Ref. 18) does not breakdown code 01 to the 3rd digit. However, a review of the data indicates most commands are using a three-digit code breakdown published by COMNAVAIRPAC (Ref. 31):

Operational Support (010)	Manning Standby Aircraft (015)
Ground Handling (011)	Troubleshoot Launch Aircraft (016)
Servicing (012)	Inertial Navigation System (017)
Mission Configuration (013)	FOD Walkdown (018)
Ground Safety (014)	Other (019)

From a contractor's standpoint, only two of these sub-tasks are considered design related: Servicing (012) and Troubleshoot Launch Aircraft (016). Additional data on these sub-tasks is provided in paragraphs 5.22.1 and 5.22.2.

Weight empty, sortie length and fuselage wetted area were the design parameters selected by the regression analysis program as having the greatest effect on Operational Support. For the Maintenance Index equation, the relationship was directly proportional to weight empty and inversely proportional to sortie length. For the Frequency Index equation, the relationship was directly proportional to fuselage wetted area and sortie length. Fighter aircraft required more maintenance (support) than attack aircraft because of their design characteristics as illustrated in Figures 5.22-1 and 5.22-2.

The A-7E and F-8J were eliminated from the regression analysis because of unsatisfactory regression correlation. To include them would have distorted the trend for the majority of the aircraft.

Completion of code 01 index graphs requires the user to complete Part I of Figure 5.22-3. Data for this worksheet must be extracted from the Servicing and Troubleshoot Launch Aircraft worksheets.

TABLE 5.22-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 01 SYSTEM: OPERATIONAL SUPPORT

ACFT	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
CLASS 1 MAINTENANCE - 3M											
A4M	3.705	3.057	1.21	-	-	.007	.002	2.80	-	-	3.712
A6E	8.012	3.754	2.13	-	-	.061	.042	1.45	-	-	8.073
A7E	8.076	4.400	1.84	-	-	.008	.005	1.54	-	-	8.084
AV8A	5.511	3.587	1.53	-	-	.012	.005	2.40	-	-	5.523
F4J	9.530	3.817	2.50	-	-	.068	.020	3.35	-	-	9.598
F8J	11.873	5.793	2.05	-	-	.009	.009	1.00	-	-	11.882
F14A	11.075	5.230	2.12	-	-	.382	.585	.65	-	-	11.457
S3A	7.938	4.950	1.60	-	-	.130	.219	.59	-	-	8.068
CLASS 3 MAINTENANCE - DESIGN EQUIVALENT											
A4M	.906	1.586	.57	-	-	-	-	-	-	-	.906
A6E	1.097	.993	1.10	-	-	-	-	-	-	-	1.097
A7E	1.237	1.199	1.03	-	-	-	-	-	-	-	1.237
AV8A	.771	1.147	.67	-	-	-	-	-	-	-	.771
F4J	1.001	1.587	.63	-	-	.001	.002	.50	-	-	1.002
F8J	2.227	2.262	.98	-	-	.002	.007	.29	-	-	2.229
F14A	2.127	2.050	1.04	-	-	.157	.460	.34	-	-	2.284
S3A	1.518	1.585	.96	-	-	.058	.212	.27	-	-	1.576

WUC: 01 SYSTEM: OPERATIONAL SUPPORT

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI		ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	SORTIE LENGTH HOURS (SL)
	ACTUAL	CALCULATED			
A4M	3.705	3.785	-.080	10.4	1.550
A6E	8.012	8.368	-.356	26.0	1.830
AV8A	5.511	5.307	.204	12.0	1.050
F4J	9.530	9.823	-.293	30.8	1.380
F14A	11.075	10.738	.337	38.2	1.560
S3A	7.938	7.751	.187	26.6	2.680

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	-7.9012 + 5.3533 ln (WTMT) -1.9394 ln (SL)
CORRELATION COEFFICIENT	r =	0.9942
STANDARD ERROR OF ESTIMATE	S =	0.4098
CONFIDENCE LEVEL, 95%	2S =	±0.8196
NUMBER OF OBSERVATIONS	N =	6

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	FUSELAGE WETTED AREA X 10^3 FT^2 (FUSWET)	SORTIE LENGTH HOURS (SL)
	ACTUAL	CALCULATED			
A4M	3.057	3.308	-.251	.487	1.550
A6E	3.754	4.253	-.499	1.006	1.830
AV8A	3.587	3.158	.429	.541	1.050
F4J	3.817	3.896	-.079	.913	1.380
F14A	5.230	5.132	.098	1.647	1.560
S3A	4.950	4.649	.301	1.004	2.680

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	1.8159 + 1.5686 (FUSWET) +0.4695 (SL)
CORRELATION COEFFICIENT	r =	0.9110
STANDARD ERROR OF ESTIMATE	S =	0.6028
CONFIDENCE LEVEL, 95%	2S =	±1.2056
NUMBER OF OBSERVATIONS	N =	6

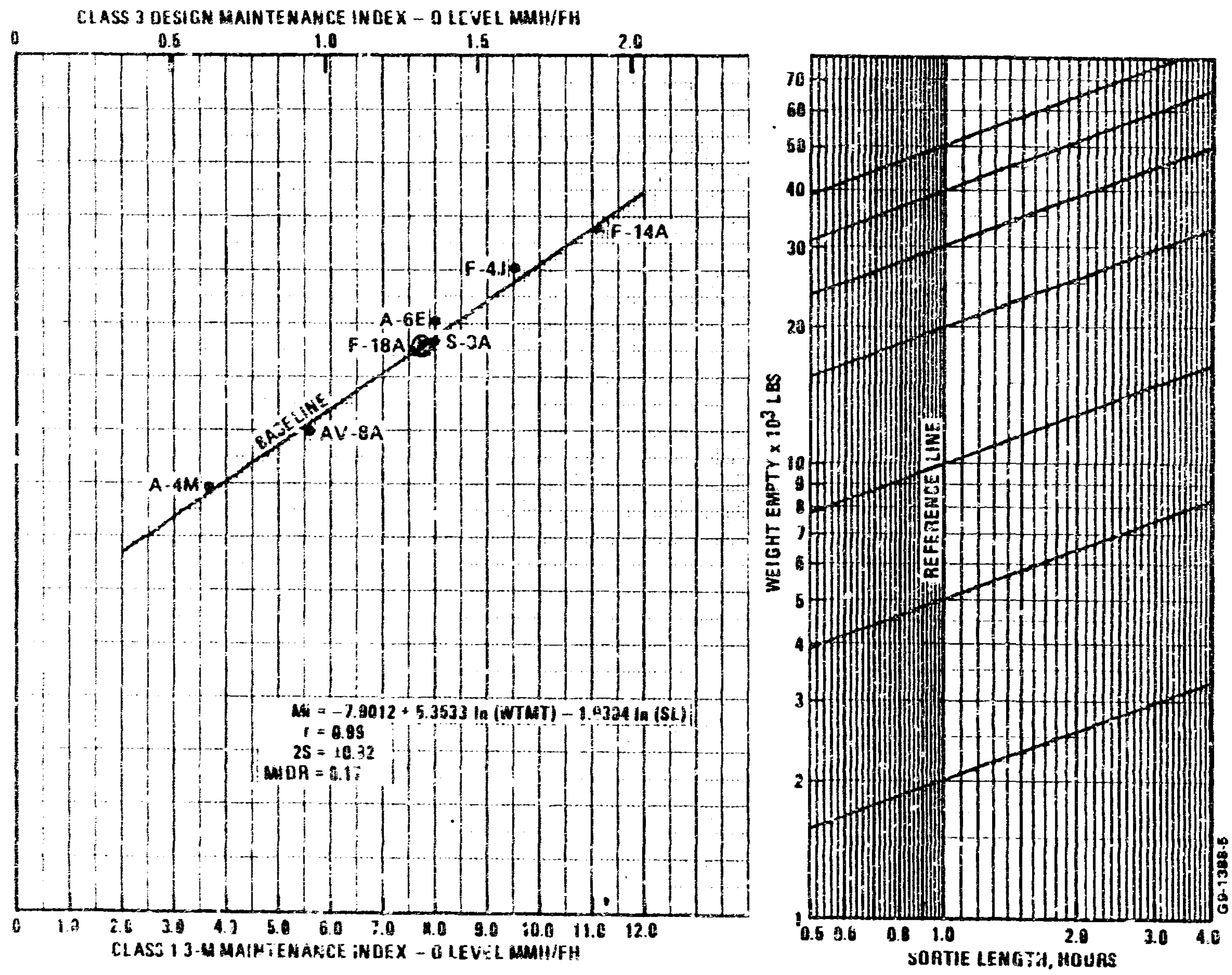

Figure 5.22-1 WUC 01 Operational Support Maintenance Index Graph

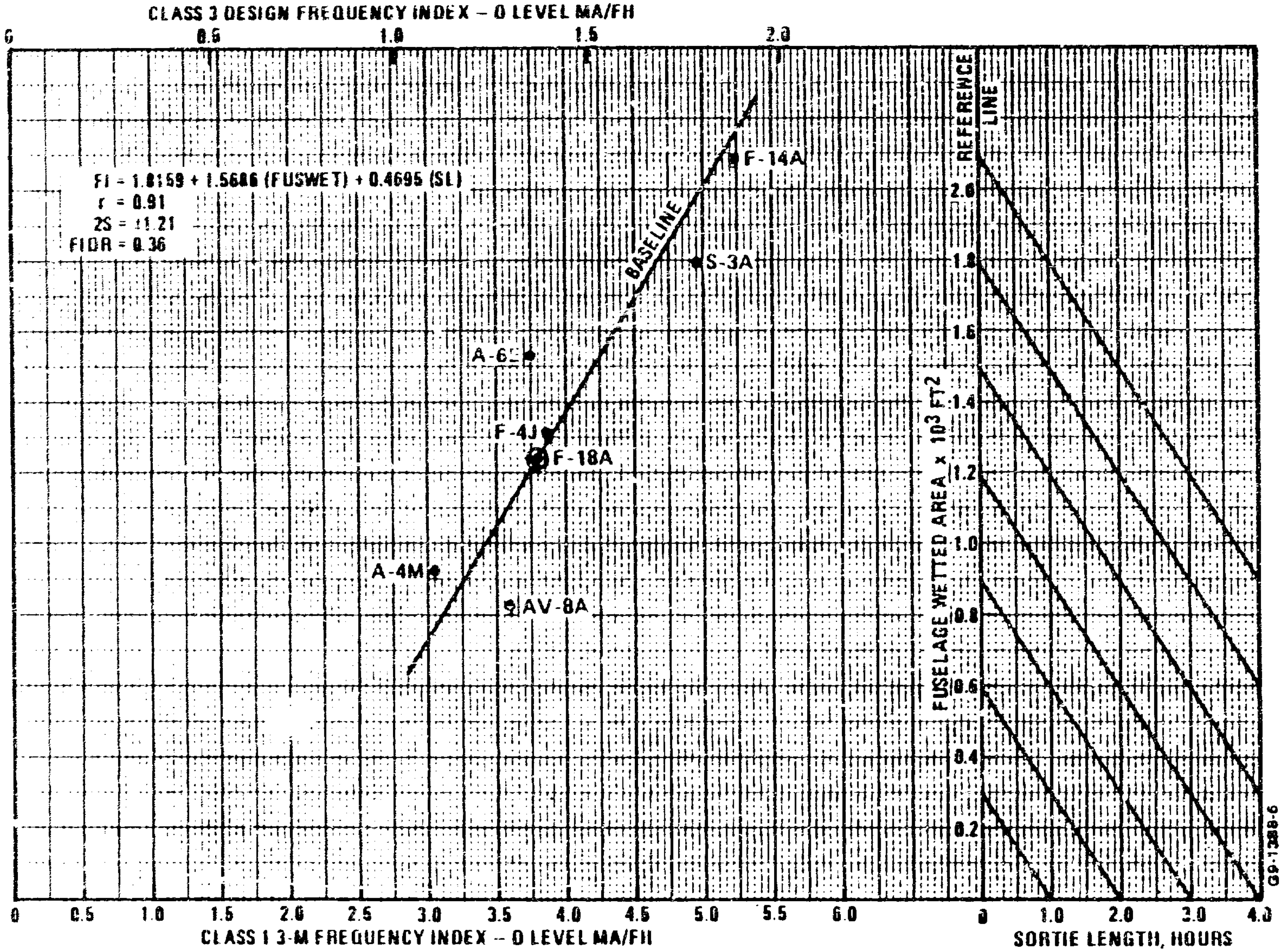

Figure 5.22-2 WUC 01 Operational Support Frequency Index Graph

WUC: 21 CONTRACTOR:
SYSTEM: Operational Support AIRCRAFT MODEL:

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Weight Empty, lbs.	
Sortie Length, Hrs.	
Fuselage Wetted Area, Ft^2	

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.01	
FIIR	MA/FH I LEVEL RATIO	.03	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) Δ	%
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	$MMH/FH_O \div MA/FH_O$				
	÷				
	÷				
EMT/MA_O (4)	$MMH/MA_O \div MEN_O$				
	÷				
	÷				
MMH/FH_I (5)	$MMH/FH_O \times MIIR$				
	×				
	×				
MA/FH_I (6)	$MA/FH_O \times FIIR$				
	×				
	×				
MMH/MA_I (7)	$MMH/FH_I \div MA/FH_I$				
	÷				
	÷				
EMT/MA_I (8)	$MMH/MA_I \div MEN_I$				
	÷				
	÷				
$MMH/FH_{O,I}$ (9)	$MMH/FH_O + MMH/FH_I$				

Figure 5.22-3 Worksheet for Evaluating System Maintenance Requirements

5.22.1 SERVICING - WUC 012

Selected Parameters: Weight empty, sortie length, and maximum speed.

Number of Regression Equations Run: 8

Parameters Considered and Rejected: Thrust/weight ratio, weight combat, and weight maximum takeoff.

Comments: Empty weight, sortie length, and maximum speed were the three design parameters selected by the regression analysis program as having the greatest effect on servicing.

Analysis showed that sortie length was a significant driver of servicing maintenance. Index graphs for both MI and FI equations show a negative slope indicating servicing maintenance is inversely proportional to sortie length. Aircraft with higher sortie lengths exhibit lower MI and FI values. For example, doubling the AV-8A sortie length from its current 1.05 hour average to 2.10 hours would reduce the MI 23% and the FI 30%, respectively.

A Maintenance Index Defect Ratio (MIDR) of 0.67 was established based on an analysis of A-7A and F-14A demonstration data. The analysis indicates that 67% of the 3-M reported servicing time is design related. Since all servicing tasks are considered design related, Frequency Index Defect Ratio (FIDR) = 1.0.

The F-8J and F-14A were eliminated from the MI regression analysis because of unsatisfactory regression correlation. For the FI analysis, the F-8J was omitted. Actual MI and FI values exceeded the norm.

TABLE 5.22.1-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 012 SYSTEM: SERVICING

ACFT	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
CLASS 1 MAINTENANCE - 3M											
A4M	.955	1.010	.94	-	-	-	-	-	-	-	.955
A6E	1.022	.655	1.56	-	-	-	-	-	-	-	1.022
A7E	1.033	.713	1.45	-	-	-	-	-	-	-	1.033
AV8A	1.136	1.140	.99	-	-	-	-	-	-	-	1.136
F4J	1.100	1.208	.91	-	-	.002	.002	1.00	-	-	1.102
F8J	2.161	1.461	1.48	-	-	.001	.005	.20	-	-	2.162
F14A	1.426	1.190	1.20	-	-	.230	.459	.50	-	-	1.656
S3A	.760	.712	1.06	-	-	.088	.212	.41	-	-	.848
CLASS 3 MAINTENANCE - DESIGN EQUIVALENT											
A4M	.536	1.010	.63	-	-	-	-	-	-	-	.636
A6E	.685	.655	1.04	-	-	-	-	-	-	-	.685
A7E	.693	.713	.97	-	-	-	-	-	-	-	.693
AV8A	.756	1.140	.66	-	-	-	-	-	-	-	.756
F4J	.737	1.208	.61	-	-	.001	.002	.67	-	-	.738
F8J	1.449	1.461	.99	-	-	.001	.005	.13	-	-	1.449
F14A	.957	1.190	.80	-	-	.154	.459	.33	-	-	1.111
S3A	.506	.712	.71	-	-	.058	.212	.27	-	-	.564

TABLE 5.22.1-2 REGRESSION ANALYSIS SUMMARY

REV A

WUC: 012 SYSTEM: SERVICING

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI		ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	SORTIE LENGTH HOURS (SL)
	ACTUAL	CALCULATED			
A4M	.955	.993	-.038	10.4	1.550
A6E	1.022	.992	.030	26.0	1.830
A7E	1.033	.986	.047	18.9	1.730
AV8A	1.136	1.129	.007	12.0	1.050
F4J	1.100	1.130	-.030	30.8	1.380
S3A	.760	.776	-.016	26.6	2.680

STATISTICAL PARAMETERS:

REGRESSION EQUATION MI = 1.3441 + 0.0046 (WTMT) -0.2573 (SL)

CORRELATION COEFFICIENT r = 0.9672

STANDARD ERROR OF ESTIMATE S = 0.0058

CONFIDENCE LEVEL, 95% 2S = ±0.0116

NUMBER OF OBSERVATIONS N = 6

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	SORTIE LENGTH HOURS (SL)	MAXIMUM SPEED X 10^3 KNOTS (VMAX)
	ACTUAL	CALCULATED			
A4M	1.010	.913	.097	1.550	.537
A6E	.655	.813	-.158	1.830	.490
A7E	.713	.847	-.134	1.730	.506
AV8A	1.140	1.077	.063	1.050	.525
F4J	1.208	1.210	-.002	1.380	1.230
F14A	1.190	1.176	.014	1.560	1.314
S3A	.712	.593	.119	2.680	.410

STATISTICAL PARAMETERS:

REGRESSION EQUATION FI = 1.2895 - 0.4381 ln (SL) +0.2970 ln (VMAX)

CORRELATION COEFFICIENT r = 0.8975

STANDARD ERROR OF ESTIMATE S = 0.0707

CONFIDENCE LEVEL, 95% 2S = ±0.1414

NUMBER OF OBSERVATIONS N = 7

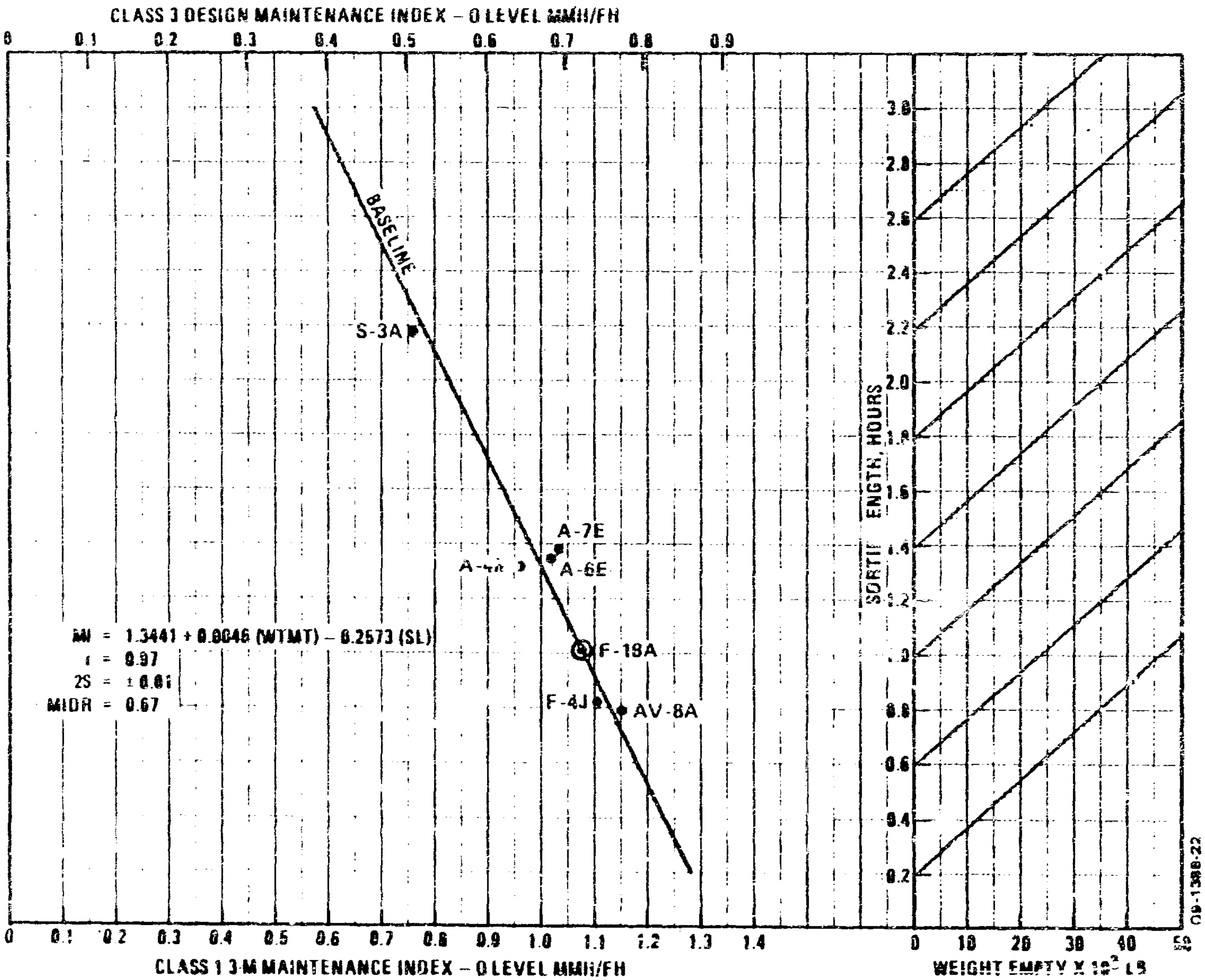

Figure 5.22.1-1 WUC 012 Servicing Maintenance Index Graph

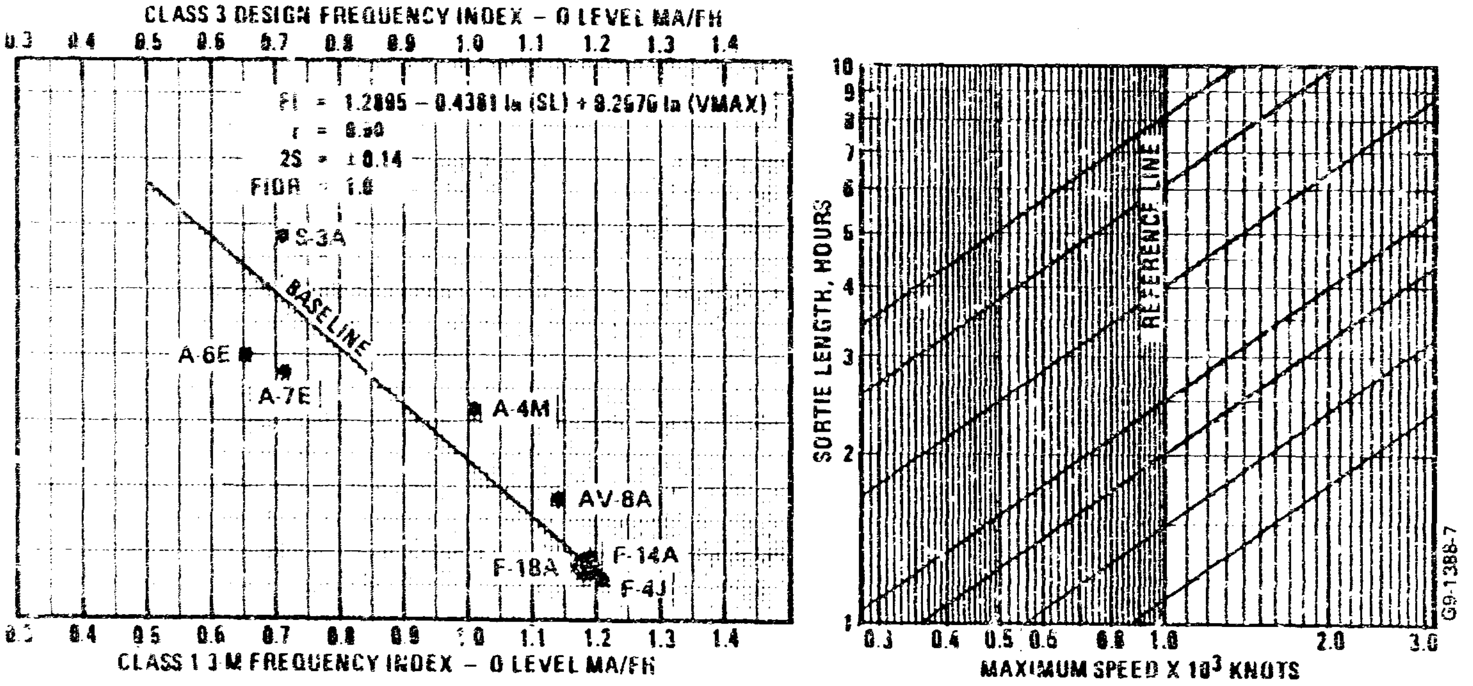

Figure 5.22.1-2 WUC 012 Servicing Frequency Index Graph

WUC: 012 CONTRACTOR: ______

SYSTEM: Servicing AIRCRAFT MODEL: ______

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS — CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Weight Empty, lbs.	
Sortie Length, hrs.	
Maximum Speed, Knots	

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN — O LEVEL	---	
MEN_I	AVG NO. MEN — I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.00	
FIIR	MA/FH I LEVEL RATIO	.00	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) Δ	%
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	$MMH/FH_O \div MA/FH_O$				
	÷				
	÷				
EMT/MA_O (4)	$MMH/MA_O \div MEN_O$				
	÷				
	÷				
MMH/FH_I (5)	$MMH/FH_O \times MIIR$				
	X				
	X				
MA/FH_I (6)	$MA/FH_O \times FIIR$				
	X				
	X				
MMH/MA_I (7)	$MMH/FH_I \div MA/FH_I$				
	÷				
	÷				
EMT/MA_I (8)	$MMH/MA_I \div MEN_I$				
	÷				
	÷				
$MMH/FH_{O,I}$ (9)	$MMH/FH_O + MMH/FH_I$				

Figure 5.22.1-3 Worksheet for Evaluating System Maintenance Requirements

5.22.2 TROUBLESHOOT LAUNCH AIRCRAFT - WUC 016

Selected Parameters: Weight combat, weight avionics installed, and thrust/weight ratio.

Number of Regression Equations Run: 4

Parameters Considered and Rejected: Weight empty, weight maximum takeoff, and wetted area.

Comments: Support sub-task Troubleshoot Launch Aircraft is considered design related since it is a function of equipment reliability and fault isolation ability. Combat weight, installed avionics weight and thrust/weight ratio were the parameters selected as having the greatest impact on this task. Regression analysis results are shown in Figures 5.22.2-1 and 5.22.2-2.

The A-6E, AV-8A and F-4J were deleted from the regression analysis because actual MMH/FH and MA/FH values were much lower than calculated values. A correlation between aircraft design and maintenance expenditure was not shown for these aircraft.

TABLE 5.22.2-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 016 SYSTEM: TROUBLESHOOT LAUNCH A/C

ACFT	O LEVEL MMH/FH	O LEVEL MA/FH	O LEVEL MMH/MA	O LEVEL EMT/MA	O LEVEL MEN	I LEVEL MMH/FH	I LEVEL MA/FH	I LEVEL MMH/MA	I LEVEL EMT/MA	I LEVEL MEN	TOTAL MMH/FH
CLASS 1 MAINTENANCE - 3M											
A4M	.406	.576	.70	-	-	-	-	-	-	-	.406
A6E	.615	.338	1.32	-	-	.001	-	-	-	-	.616
A7E	.814	.486	1.67	-	-	-	-	-	-	-	.814
AV8A	.023	.007	3.28	-	-	-	-	-	-	-	.023
F4J	.395	.379	1.04	-	-	-	-	-	-	-	.395
F8J	1.158	.801	1.45	-	-	.002	.002	1.00	-	-	1.160
F14A	1.749	.860	2.03	-	-	.005	.001	4.50	-	-	1.754
S3A	1.513	.873	1.73	-	-	-	-	-	-	-	1.513
CLASS 3 MAINTENANCE - DESIGN EQUIVALENT											
A4M	.270	.576	.47	-	-	-	-	-	-	-	.270
A6E	.412	.339	1.22	-	-	-	-	-	-	-	.412
A7E	.544	.486	1.12	-	-	-	-	-	-	-	.544
AV8A	.015	.007	2.20	-	-	-	-	-	-	-	.015
F4J	.264	.379	.70	-	-	-	-	-	-	-	.264
F8J	.778	.801	.97	-	-	.001	.002	.67	-	-	.780
F14A	1.170	.860	1.36	-	-	.003	.001	3.01	-	-	1.173
S3A	1.012	.873	1.16	-	-	-	-	-	-	-	1.012

TABLE 5.22.2-2 REGRESSION ANALYSIS SUMMARY

REV A

WUC: 016 SYSTEM: TROUBLESHOOT LAUNCH A/C

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI		ERROR	WEIGHT COMBAT X 10^3 LBS (WTCOM)	
	ACTUAL	CALCULATED			
A4M	.406	.434	-.028	17.6	
A7E	.814	.947	-.133	25.9	
F8J	1.158	.992	.166	26.8	
F14A	1.749	1.805	-.056	49.5	
S3A	1.513	1.462	.051	38.2	

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	-3.3681 + 1.3259 ln (WTCOM)
CORRELATION COEFFICIENT	r =	0.9773
STANDARD ERROR OF ESTIMATE	S =	0.0518
CONFIDENCE LEVEL, 95%	2S =	±0.1036
NUMBER OF OBSERVATIONS	N =	5

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	WEIGHT AVIONICS INSTALLED X 10 LBS (WTAVIN)	THRUST/WEIGHT RATIO (T/W)
	ACTUAL	CALCULATED			
A4M	.576	.547	.029	.612	1.076
A7E	.486	.513	-.027	1.347	.793
F14A	.860	.881	-.021	3.039	1.094
S3A	.873	.854	.019	4 223	.697

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	-0.0378 + 0.1339 (WTAVIN) +0.4677 (T/W)
CORRELATION COEFFICIENT	r =	0.9898
STANDARD ERROR OF ESTIMATE	S =	0.0024
CONFIDENCE LEVEL, 95%	2S =	±0.0048
NUMBER OF OBSERVATIONS	N =	4

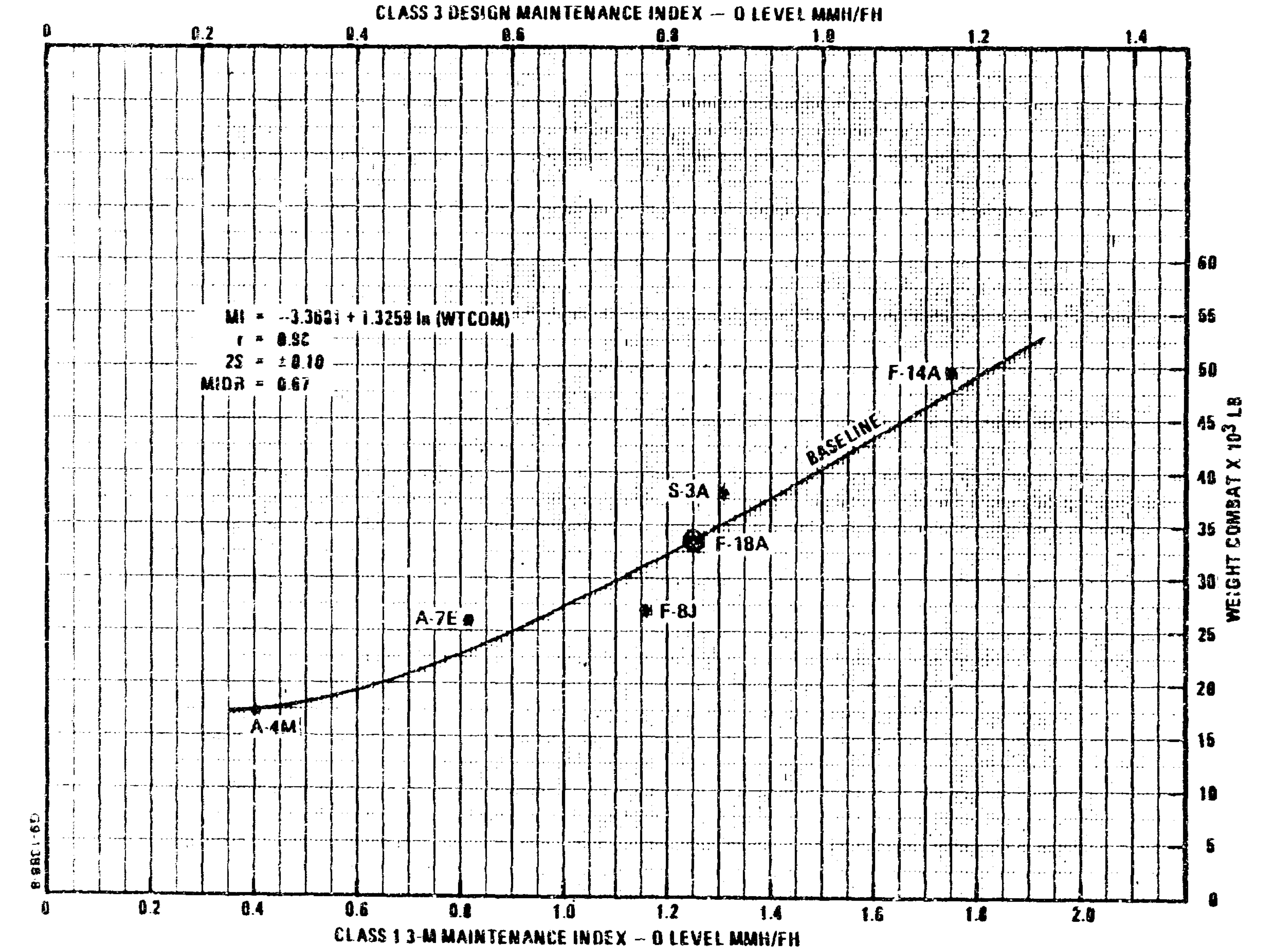

Figure 5.22.2-1 WUC 016 Troubleshoot Launch Aircraft Maintenance Index Graph

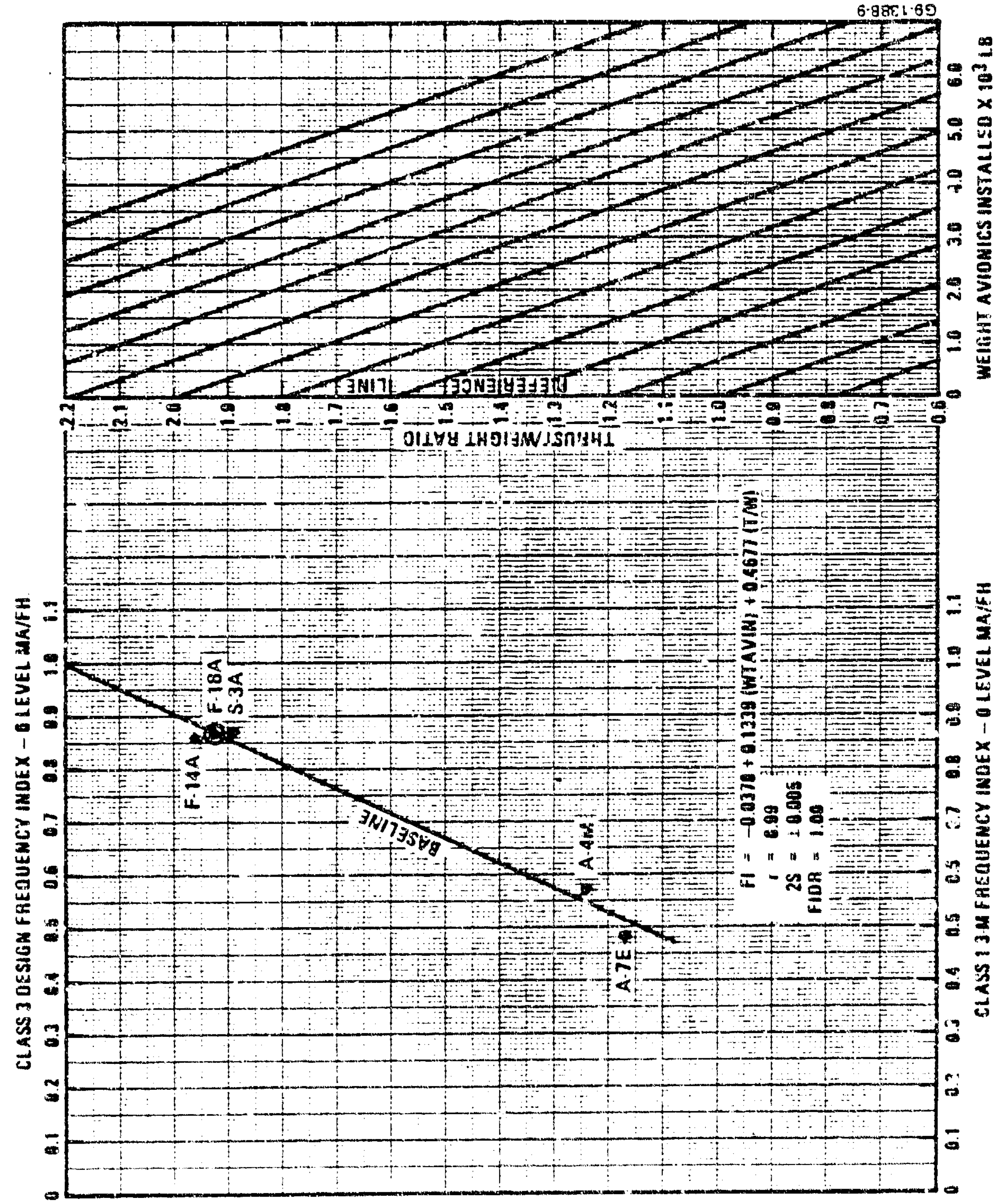

Figure 5.22.2-2 WUC 01G Troubleshoot Launch Aircraft Frequency Index Graph

WUC: 015 CONTRACTOR:

SYSTEM: Troubleshoot Launch Aircraft AIRCRAFT MODEL:

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Weight Combat, lbs. Weight Avionics Installed, lbs. Thrust/Weight Ratio	

PART II SYSTEM CONSTANTS

	PARAMETER	BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.00	
FIIR	MA/FH I LEVEL RATIO	.00	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) Δ	%
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	$MMH/FH_O \div MA/FH_O$				
	÷				
	÷				
EMT/MA_O (4)	$MMH/MA_O \div MEN_O$				
	÷				
	÷				
MMH/FH_I (5)	$MMH/FH_O \times MIIR$				
	×				
	×				
MA/FH_I (6)	$MA/FH_O \times FIIR$				
	×				
	×				
MMH/MA_I (7)	$MMH/FH_I \div MA/FH_I$				
	÷				
	÷				
EMT/MA_I (8)	$MMH/MA_I \div MEN_I$				
	÷				
	÷				
$MMH/FH_{O,I}$ (9)	$MMH/FH_O \div MMH/FH_I$				

Figure 22.2-3 Worksheet for Evaluating System Maintenance Requirements

5.23 CLEANING - WUC 02

Selected Parameters: Index constants were established for Cleaning.

Number of Regression Equations Run: 0

Parameters Considered and Rejected: None

Comments: Aircraft Cleaning is considered a Navy responsible support action task. Randomness of the data prevented a satisfactory regression analysis from being performed. As a result, index constants were established.

A Maintenance Index of 0.188 MMH/FH was determined by averaging Class 1 O-level MMH/FH. A Frequency Index of 0.097 MA/FH was determined by averaging Class 1 O-level MA/FH. Given these two constants, the remaining Class 1 baseline parameters can be calculated. Results are shown in Figure 5.23-1.

TABLE 5.23-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 020 SYSTEM: CLEANING

ACFT	CLASS 1 MAINTENANCE - 3M										
	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
A4M	.030	.029	1.03	-	-	.044	.044	1.00	-	-	.074
A6E	.129	.106	1.22	-	-	.015	.003	5.00	-	-	.144
A7E	.216	.073	2.95	-	-	.005	.005	1.05	-	-	.221
AV8A	.188	.243	.80	-	-	.015	.011	1.36	-	-	.203
F4J	.317	.159	1.99	-	-	.017	.008	2.12	-	-	.334
F8J	.293	.076	3.85	-	-	.006	.020	.30	-	-	.299
F14A	.136	.041	3.31	-	-	.019	.005	3.76	-	-	.155
S3A	.198	.047	4.21	-	-	.022	.008	2.75	-	-	.220
	CLASS 3 MAINTENANCE - DESIGN EQUIVALENT										
A4M				-	-				-	-	
A6E				-	-				-	-	
A7E				-	-				-	-	
AV8A				-					-	-	
F4J				-	NOT APPLICABLE				-	-	
F8J				-					-	-	
F14A				-	-				-	-	
S3A				-	-				-	-	

WUC: 02 CONTRACTOR: ____________

SYSTEM: Cleaning AIRCRAFT MODEL: ____________

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O	---	---	---	---
I	---	---	---	---

DESIGN/PERFORMANCE PARAMETERS	
None	---

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.08	
FIIR	MA/FH I LEVEL RATIO	.12	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) Δ	IMPROVEMENT (DEGRADATION) (C) %
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE	.188			
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE	.097			
	PREDICTED				
MMH/MA_O (3)	$MMH/FH_O \div MA/FH_O$				
	.188 ÷ .097	1.94			
	÷				
EMT/MA_O (4)	$MMH/MA_O \div MEN_O$				
	.194 ÷ NA	---			
	÷				
MMH/FH_I (5)	MMH/FH_O X MIIR				
	.188 X .08	.015			
	X				
MA/FH_I (6)	MA/FH_O X FIIR				
	.097 X .12	.012			
	X				
MMH/MA_I (7)	$MMH/FH_I \div MA/FH_I$				
	.015 ÷ .012	1.25			
	÷				
EMT/MA_I (8)	$MMH/MA_I \div MEN_I$				
	[illegible] ÷ [illegible]				
	÷				
$MMH/FH_{O,I}$ (9)	$MMH/FH_O + MMH/FH_I$	[illegible]			

Figure 5.23-1 Worksheet for Evaluating System Maintenance Requirements

5.24 INSPECTION - WUC 03

Support Action Code (WUC) 03 identifies maintenance expended for scheduled aircraft inspections. A further breakdown to the third and subsequent digit proved to complicated because of the numerous types of inspections reported and the manner in which they were documented. Instead, a grouping of 03 coded data by Type Maintenance Codes was selected:

INSPECTION	STANDARD WUC	TYPE MAINT. CODE
Turnaround/Preflight	03C	C
Daily/Special	03D	D, M, N
Phase	03G	G, J, K, P, Q
Conditional	03S	S
Other	03Z	A, E, F, L, T, U

5.24.1 TURNAROUND/PREFLIGHT INSPECTION - WUC 03C

Selected Parameters: Weight combat, weight empty, and sortie length.

Number of Regression Equations Run: 6

Parameters Considered and Rejected: Weight maximum takeoff

Comments: Turnaround/Preflight Inspection is considered a design related support action task (FIDR = 1.0 and MIDR = 0.67). Data reported under Standard Work Unit Code (SWUC) 03C is grouped by Support Action Code 03 (Inspection) and Type Maintenance Code C (Turnaround, Preflight Inspections).

Regression analysis showed that combat weight, weight empty and sortie length had the greatest effect on this task. As expected, larger aircraft with more surface area required more turnaround and preflight scheduled maintenance.

The A-6E and F-8J were excluded from the FI regression analysis because of low regression correlation. Actual values for both aircraft were about 27% below the norm. Specific reasons for this could not be determined using the data.

TABLE 5.24.1-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 03C SYSTEM: TURNAROUND/PREFLIGHT INSPECTION

ACFT	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
CLASS 1 MAINTENANCE - 3M											
A4M	.593	.591	1.00	-	-	-	-	-	-	-	.593
A6E	1.615	.600	2.69	-	-	-	-	-	-	-	1.615
A7E	.756	.544	1.37	-	-	-	.001	.57	-	-	.756
AV8A	.826	.641	1.28	-	-	-	-	-	-	-	.826
F4J	1.428	1.069	1.34	-	-	-	-	-	-	-	1.428
F8J	.679	.550	1.23	-	-	.001	-	-	-	-	.680
F14A	1.612	1.074	1.49	-	-	.002	.001	1.60	-	-	1.613
S3A	1.417	.757	1.87	-	-	.001	.001	1.06	-	-	1.418
CLASS 3 MAINTENANCE - DESIGN EQUIVALENT											
A4M	.396	.591	.67	-	-	-	-	-	-	-	.396
A6E	1.081	.600	1.80	-	-	-	-	-	-	-	1.081
A7E	.509	.544	.92	-	-	-	.001	.38	-	-	.509
AV8A	.550	.641	.86	-	-	-	-	-	-	-	.550
F4J	.960	1.069	.90	-	-	-	-	-	-	-	.960
F8J	.453	.550	.82	-	-	-	-	-	-	-	.453
F14A	1.072	1.074	1.00	-	-	.001	.001	1.07	-	-	1.073
S3A	.948	.757	1.25	-	-	.001	.001	.67	-	-	.949

TABLE 5.24.1-2 REGRESSION ANALYSIS SUMMARY

REV A

WUC: 03C SYSTEM: TURNAROUND/PREFLIGHT INSPECTION

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI		ERROR	WEIGHT COMBAT X 10^3 LBS (WTCOM)	
	ACTUAL	CALCULATED			
A4M	.593	.580	.013	17.6	
A6E	1.615	1.545	.070	45.5	
A7E	.756	.867	-.111	25.9	
AV8A	.826	.646	.180	19.5	
F4J	1.428	1.414	.014	41.7	
F8J	.679	.898	-.219	26.8	
F14A	1.612	1.683	-.071	49.5	
S3A	1.417	1.293	.124	38.2	

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	-0.0282 + 0.0346 (WTCOM)
CORRELATION COEFFICIENT	r =	0.9554
STANDARD ERROR OF ESTIMATE	S =	0.1188
CONFIDENCE LEVEL, 95%	2S =	±0.2376
NUMBER OF OBSERVATIONS	N =	8

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	SORTIE LENGTH HOURS (SL)
	ACTUAL	CALCULATED			
A4M	.591	.537	.054	10.4	1.550
A7E	.554	.690	-.136	18.9	1.730
AV8A	.641	.638	.003	12.0	1.050
F4J	1.069	.985	.084	30.8	1.380
F14A	1.074	1.115	-.041	38.2	1.560
S3A	.757	.721	.036	26.6	2.680

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	0.5305 + 0.0208 (WTMT) -0.1358 (SL)
CORRELATION COEFFICIENT	r =	0.9417
STANDARD ERROR OF ESTIMATE	S =	0.0313
CONFIDENCE LEVEL, 95%	2S =	±0.0626
NUMBER OF OBSERVATIONS	N =	6

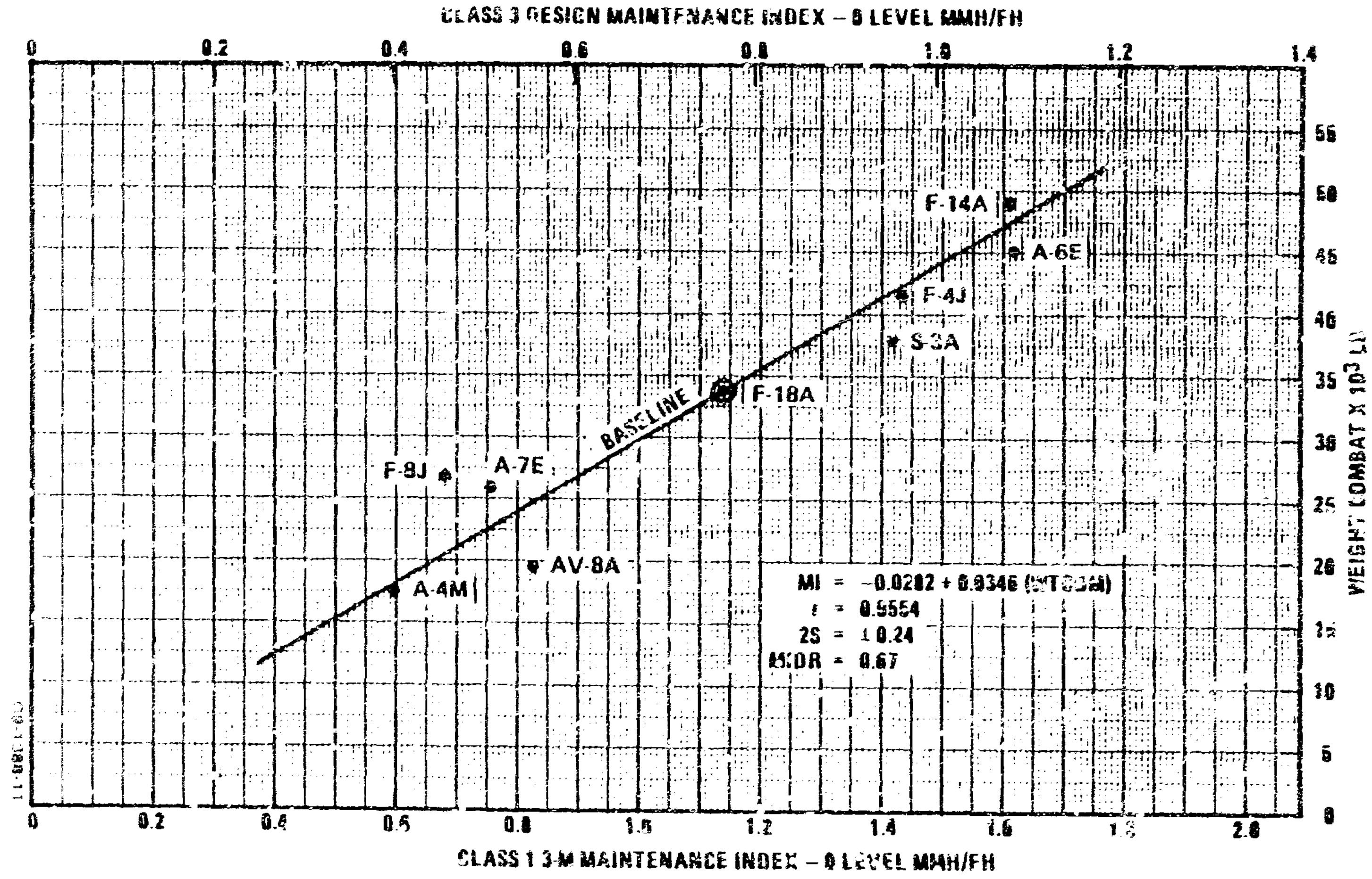

Figure 5.24.1-1 WUC 03C Turnaround/Preflight Inspection Maintenance Index Graph

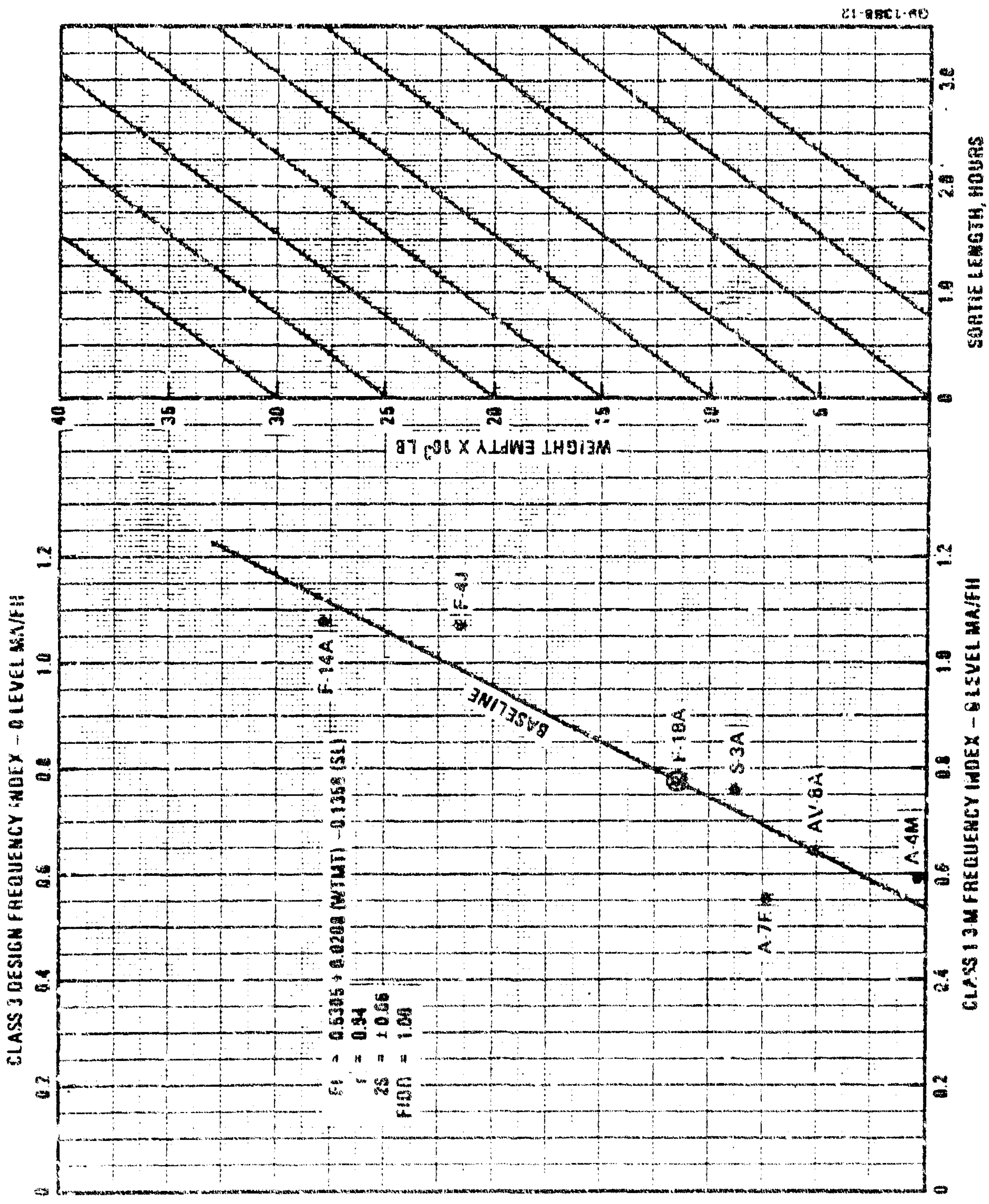

Figure 5.24.1 2 WUC 03C Turnaround/Preflight Inspection Frequency Index Graph

WUC: 030 CONTRACTOR:

SYSTEM: Turnaround/Preflight Inspection AIRCRAFT MODEL:

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Weight Combat, lbs. Weight Empty, lbs. Sortie Length, hrs.	

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.00	
FIIR	MA/FH I LEVEL RATIO	.00	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) Δ	%
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	$MMH/FH_O \div MA/FH_O$				
	÷				
	÷				
EMT/MA_O (4)	$MMH/MA_O \div MEN_O$				
	÷				
	÷				
MMH/FH_I (5)	$MMH/FH_O \times MIIR$				
	X				
	X				
MA/FH_I (6)	$MA/FH_O \times FIIR$				
	X				
	X				
MMH/MA_I (7)	$MMH/FH_I \div MA/FH_I$				
	÷				
	÷				
EMT/MA_I (8)	$MMH/MA_I \div MEN_I$				
	÷				
	÷				
MMH/FH_{O+I} (9)	$MMH/FH_O + MMH/FH_I$				

Figure 5.24.1-3 Worksheet for Evaluating System Maintenance Requirements

5.24.2 DAILY/SPECIAL INSPECTION - WUC 03D

Selected Parameters: Weight empty, sortie length, wetted area, and thrust/weight ratio.

Number of Regression Equations Run: 10

Parameters Considered and Rejected: Maximum speed, weight combat, and weight maximum takeoff.

Comments: Daily/Special Inspection is considered a design related support action task. All maintenance actions reported against this code are the responsibility of the contractor (FIDR = 1.0), while only 67% of the maintenance time is contractor controllable (MIDR = 0.67). Data reported under SWUC 03D is grouped by Support Action Code 03 (Inspection) and the following Type Maintenance Codes:

- D Daily/Postflight, Daily Special Inspection
- M Hourly Special Aircraft Inspections
- N Cycle/Event Special Aircraft Inspections

The highest maintenance expenditure for scheduled aircraft inspections in this grouping was reported for Daily/Special Inspections. MI values from 1.4 to 4.0 MMH/FH were reported in the data base.

The Maintenance Index regression analysis was found to be directly proportional to weight empty and inversely proportional to sortie length. The Frequency Index equation was found to be directly proportional to fuselage wetted area and thrust/weight ratio.

The A-4M and F-8J were deleted from the Frequency Index regression analysis because of unsatisfactory correlation. Actual values for both aircraft exceeded calculated values by a factor of two. Average inspection time measured in MMH/MA was much lower for these aircraft than the other aircraft.

TABLE 5.24.2-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 03D SYSTEM: DAILY/SPECIAL INSPECTION

ACFT	O LEVEL MMH/FH	O LEVEL MA/FH	O LEVEL MMH/MA	O LEVEL EMT/MA	O LEVEL MEN	I LEVEL MMH/FH	I LEVEL MA/FH	I LEVEL MMH/MA	I LEVEL EMT/MA	I LEVEL MEN	TOTAL MMH/FH
CLASS 1 MAINTENANCE - 3M											
A4M	1.445	1.383	1.04	-	-	.002	.001	1.00	-	-	1.447
A6E	3.061	.689	4.44	-	-	.020	.002	10.00	-	-	3.081
A7E	1.894	.502	3.77	-	-	.001	.003	.27	-	-	1.895
AV8A	2.397	1.110	2.16	-	-	-	-	-	-	-	2.397
F4J	3.678	.981	3.75	-	-	.003	.001	3.00	-	-	3.681
F8J	2.683	1.660	1.62	-	-	.011	.004	2.75	-	-	2.694
F14A	4.038	1.415	2.85	-	-	.038	.003	12.73	-	-	4.076
S3A	1.788	.797	2.24	-	-	.001	.001	1.00	-	-	1.789
CLASS 3 MAINTENANCE - DESIGN EQUIVALENT											
A4M	.964	1.383	.70	-	-	.001	.001	.67	-	-	.964
A6E	2.050	.689	2.98	-	-	.013	.002	6.70	-	-	2.063
A7E	1.268	.502	2.53	-	-	.001	.003	.18	-	-	1.269
AV8A	1.606	1.110	1.45	-	-	-	-	-	-	-	1.606
F4J	2.465	.981	2.51	-	-	.002	.001	2.01	-	-	2.467
F8J	1.802	1.660	1.09	-	-	.007	.004	1.84	-	-	1.809
F14A	2.702	1.415	1.91	-	-	.026	.003	8.53	-	-	2.728
S3A	1.19[illegible]	.797	1.50	-	-	.001	.001	.67	-	-	1.197

TABLE 5.24.2-2 REGRESSION ANALYSIS SUMMARY

REV A

WUC: 03D SYSTEM: DAILY/SPECIAL INSPECTION

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI		ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	SORTIE LENGTH HOURS (SL)
	ACTUAL	CALCULATED			
A4M	1.445	1.550	-.105	10.4	1.550
A6E	3.061	2.706	.355	26.0	1.830
A7E	1.894	2.148	-.254	18.9	1.730
AV8A	2.397	2.280	.116	12.0	1.050
F4J	3.678	3.682	-.004	30.8	1.380
F8J	2.683	2.662	.021	19.8	1.360
F14A	4.038	4.175	-.137	38.2	1.560
S3A	1.788	1.780	.008	26.6	2.680

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	2.3571 + 0.0948 (WTMT) -1.1568 (SL)
CORRELATION COEFFICIENT	r =	0.9802
STANDARD ERROR OF ESTIMATE	S =	0.2348
CONFIDENCE LEVEL, 95%	2S =	±0.4696
NUMBER OF OBSERVATIONS	N =	8

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	FUSELAGE WETTED AREA X 10^3 FT^2 (FUSWET)	THRUST/WEIGHT RATIO (T/W)
	ACTUAL	CALCULATED			
A6E	.689	.712	-.023	1.006	715
A7E	.502	.583	-.081	.749	93
AV8A	1.110	1.102	.008	.541	1.741
F4J	.981	.961	.020	.913	1.162
F14A	1.415	1.439	-.024	1.647	1.094
S3A	.797	.698	.099	1.004	.697

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	-0.5131 + 0.7166 (FUSWET) +0.7052 (T/W)
CORRELATION COEFFICIENT	r =	0.9829
STANDARD ERROR OF ESTIMATE	S =	0.0179
CONFIDENCE LEVEL, 95%	2S =	±0.0358
NUMBER OF OBSERVATIONS	N =	6

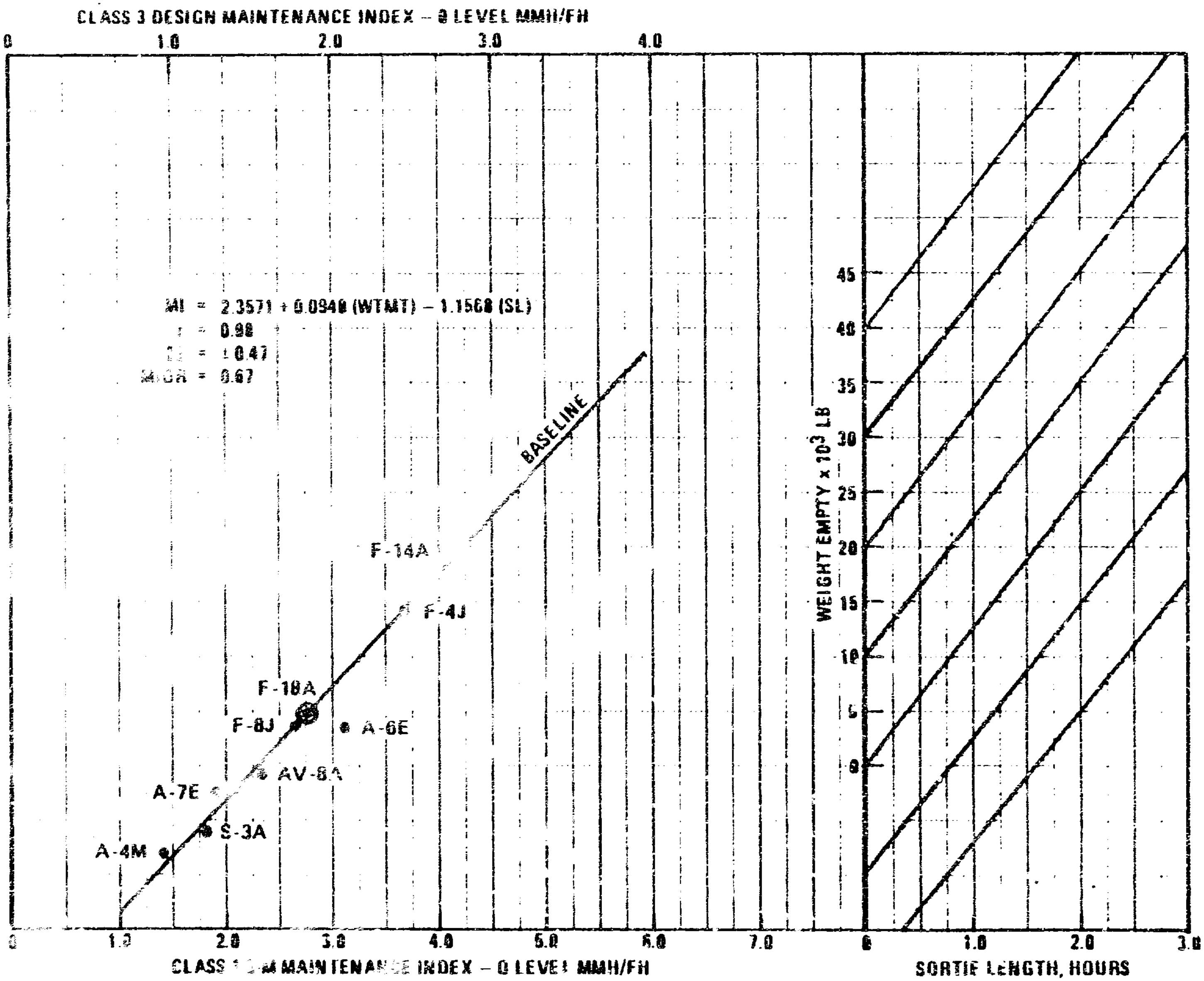

Figure 5.24.2-1 WUC 03D Daily/Special Inspection Maintenance Index Graph

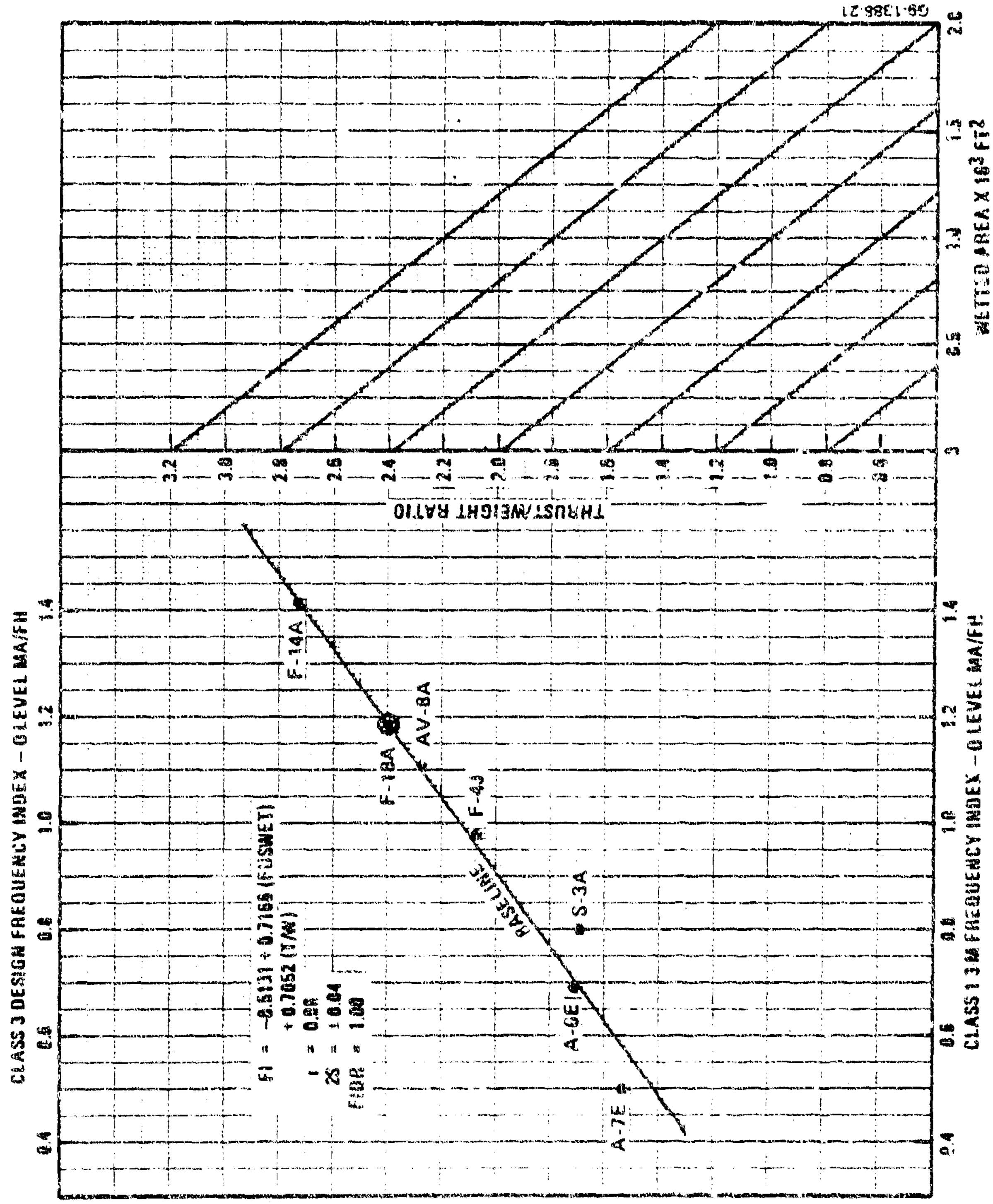

Figure 5.24.2.2 WUC 03D Daily/Special Inspection Frequency Index Graph

WUC: 03? CONTRACTOR: ____________

SYSTEM: Daily/Special Inspection AIRCRAFT MODEL: ____________

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
0				
1				

DESIGN/PERFORMANCE PARAMETERS	
Weight Empty, lbs.	
Sortie Length, hrs.	
Fuselage Wetted Area, ft^2	
Thrust/Weight Ratio	

PART II SYSTEM CONSTANTS

PARAMETER		CASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.00	
FIIR	MA/FH I LEVEL RATIO	.00	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) Δ	%
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	$MMH/FH_O \div MA/FH_O$				
	÷				
	÷				
EMT/MA_O (4)	$MMH/MA_O \div MEN_O$				
	÷				
	÷				
MMH/FH_I (5)	MMH/FH_O X MIIR				
	X				
	X				
MA/FH_I (6)	MA/FH_O X FIIR				
	X				
	X				
MMH/MA_I (7)	$MMH/FH_I \div MA/FH_I$				
	÷				
EMT/MA_I (8)	$MMH/MA_I \div MEN_I$				
	÷				
	÷				
$MMH/FH_{O,I}$	$MMH/FH_O + MMH/FH_I$				

Figure 5.24.2-3 Worksheet for Evaluating System Maintenance Requirements

5.24.3 PHASE INSPECTION - WUC 03G

Selected Parameters: Weight empty and thrust/weight ratio.

Number of Regression Equations Run: 6

Parameters Considered and Rejected: Sortie length, weight combat, density, and weight maximum takeoff.

Comments: Phase Inspection is a design related task addressing the look phase of on-aircraft scheduled maintenance. Data reported under this standard WUC is grouped by Support Action Code 03 (Inspection) and the following Type Maintenance Codes:

- G Phased Inspection
- J Major Engine Inspection
- K Special Engine Inspection
- P Calendar Odd Inspection
- Q Calendar Even Inspection

Regression analysis for the Maintenance Index equation showed that weight empty and thrust/weight ratio were the most statistically valid design parameters. Larger aircraft with higher thrust engines tend to require more scheduled maintenance.

Two aircraft were deleted from the MI regression analysis for the following reasons. The S-3A was excluded because actual MMH/FH was some 60% less than the calculated value. Good maintainability design features in the TF-34 engine are noted by an average repair time of less than 15 MMH/MA. The F-8J was excluded because actual MMH/FH was more than twice the calculated value. Excessively high repair time of almost 80 MMH/MA was reported for this older engine.

A Frequency Index constant of 0.025 MA/FH was established by averaging Class 1 O-level MA/FH data. Regression analysis for FI proved unsatisfactory because all aircraft exhibited about the same MA/FH value.

TABLE 5.24.3-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 03G SYSTEM: PHASE INSPECTION

ACFT	CLASS 1 MAINTENANCE - 3M										
	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
A4M	.645	.021	30.71	-	-	.056	.054	1.05	-	-	.701
A6E	.980	.025	39.20	-	-	.001	.001	1.00	-	-	.981
A7E	.621	.022	28.88	-	-	-	-	-	-	-	.621
AV8A	.914	.036	25.38	-	-	.014	.001	14.06	-	-	.928
F4J	1.063	.024	44.29	-	-	.103	.002	51.50	-	-	1.166
F8J	1.721	.022	78.22	-	-	.002	-	-	-	-	1.723
F14A	1.133	.030	37.75	-	-	.253	.002	99.00	-	-	1.386
S3A	.341	.023	14.82	-	-	-	-	-	-	-	.341
	CLASS 3 MAINTENANCE - DESIGN EQUIVALENT										
A4M	.432	.021	20.58	-	-	.037	.054	.69	-	-	.469
A6E	.657	.025	26.26	-	-	.001	.001	.67	-	-	.657
A7E	.426	.022	19.35	-	-	-	-	-	-	-	.426
AV8A	.612	.036	17.01	-	-	.009	.001	9.38	-	-	.622
F4J	.712	.024	29.67	-	-	.069	.002	34.51	-	-	.781
F8J	1.153	.022	52.41	-	-	-	-	-	-	-	1.153
F14A	.759	.030	25.29	-	-	.133	.002	66.33	-	-	.891
S3A	.228	.023	9.93	-	-	-	-	-	-	-	.228

TABLE 5.24.3-2 REGRESSION ANALYSIS SUMMARY

REV A

WUC: 03G SYSTEM: PHASE INSPECTION

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI ACTUAL	3M MI CALCULATED	ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	THRUST/WEIGHT RATIO (T/W)
A4M	.645	.658	-.013	10.4	1.076
A6E	.980	.841	.139	26.0	.715
A7E	.621	.732	-.111	18.9	.793
AV8A	.914	.884	.030	12.0	1.741
F4J	1.063	1.062	.001	30.8	1.162
F14A	1.133	1.180	-.047	38.2	1.094

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	0.1455 + 0.0186 (WTMT) +0.2962 (T/W)
CORRELATION COEFFICIENT	r =	0.9210
STANDARD ERROR OF ESTIMATE	S =	0.0349
CONFIDENCE LEVEL, 95%	2S =	±0.0698
NUMBER OF OBSERVATIONS	N =	6

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI ACTUAL	3M FI CALCULATED	ERROR		
NOT APPLICABLE					

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	
CORRELATION COEFFICIENT	r =	
STANDARD ERROR OF ESTIMATE	S =	
CONFIDENCE LEVEL, 95%	2S =	
NUMBER OF OBSERVATIONS	N =	

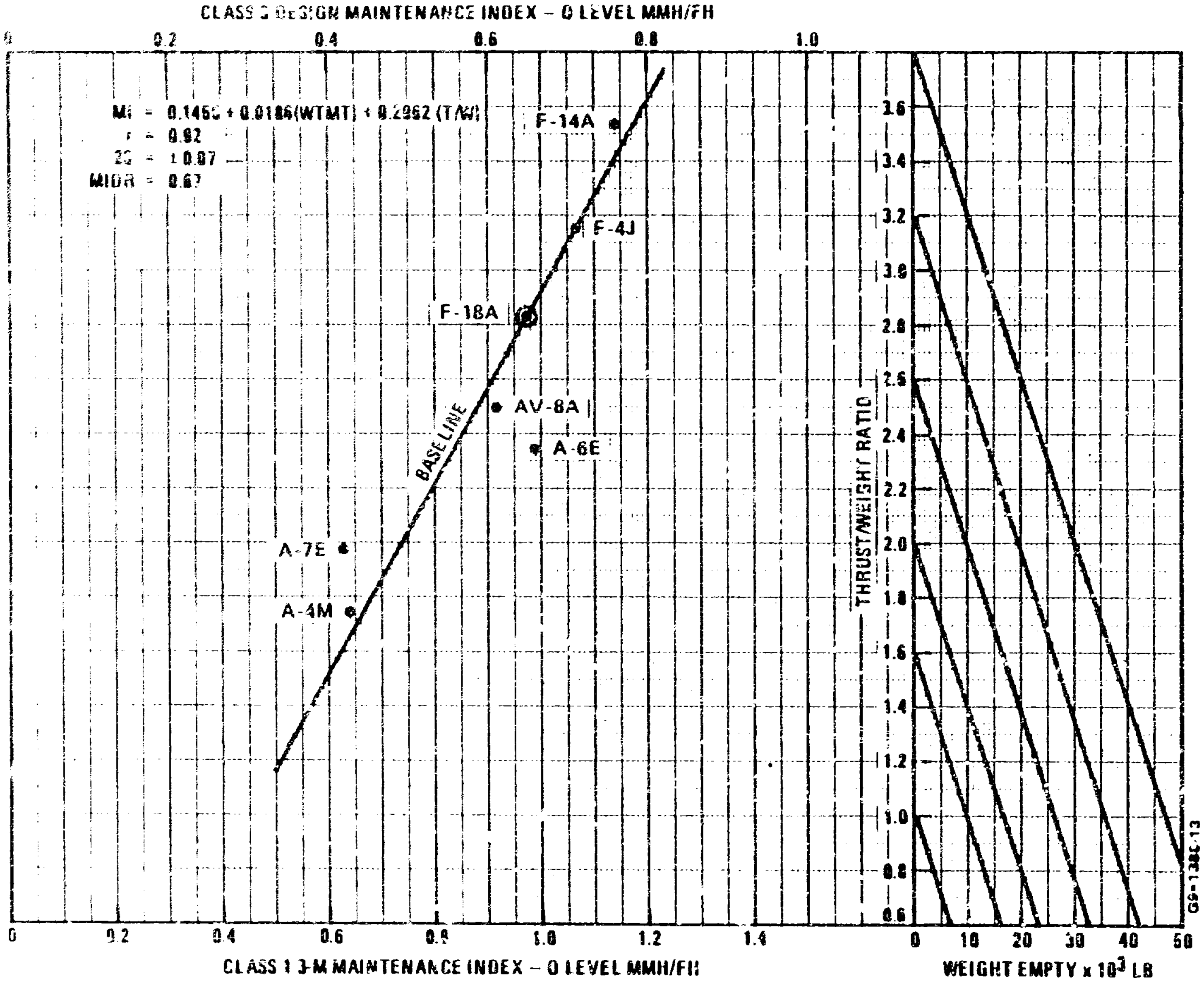

Figure 5.24.3-1 WUC 03G Phase Inspection Maintenance Index Graph

WUC: [illegible] CONTRACTOR:

SYSTEM: Phase Inspection AIRCRAFT MODEL:

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Weight Empty, lbs.	
Thrust/Weight Ratio	

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.07	
FIIR	MA/FH I LEVEL RATIO	.05	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) —	%
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	$MMH/FH_O \div MA/FH_O$				
	÷				
	÷				
EMT/MA_O (4)	$MMH/MA_O \div MEN_O$				
	÷				
	÷				
MMH/FH_I (5)	$MMH/FH_O \times MIIR$				
	X				
	X				
MA/FH_I (6)	$MA/FH_O \times FIIR$				
	X				
	X				
MMH/MA_I (7)	$MMH/FH_I \div MA/FH_I$				
	÷				
	÷				
EMT/MA_I (8)	$MMH/MA_I \div MEN_I$				
	÷				
	÷				
MMH/FH_{O+I} (9)	$MMH/FH_O + MMH/FH_I$				

Figure 5.24.3-2 Worksheet for Evaluating System Maintenance Requirements

5.24.4 CONDITIONAL INSPECTION - WUC 03S

Selected Parameters: Weight empty and density.

Number of Regression Equations Run: 3

Parameters Considered and Rejected: Weight combat and wetted area.

Comments: Conditional Inspection is considered a design related support action task. All maintenance actions reported against this code are the responsibility of the contractor (FIDR = 1.0) while only 67% of the maintenance time is contractor controllable (MIDR = 0.67). Data reported under this code is grouped by Support Action Code 03 (Inspection) and Type Maintenance Code S (Conditional Inspection).

Regression analysis for both the Maintenance and Frequency Index equations showed that weight empty and density were the most statistically valid design parameters. Density is defined as weight empty divided by fuselage volume.

Variations in conditional inspection tasks between aircraft resulted in a wide dispersal of the data. Certain aircraft were deleted from the regression analysis because to include them would have distorted the trend for the majority of the aircraft.

TABLE 5.24.4-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 03S SYSTEM: CONDITIONAL INSPECTION

ACFT	CLASS 1 MAINTENANCE - SM										
	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
A4M	.047	.017	2.76	-	-	.009	.001	9.00	-	-	.056
A6E	.478	.119	4.01	-	-	-	-	-	-	-	.478
A7E	.268	.083	3.22	-	-	-	-	-	-	-	.268
AV8A	.257	.026	9.88	-	-	.002	.002	1.00	-	-	.259
F4J	.752	.087	8.64	-	-	.002	.001	2.00	-	-	.754
F8J	.213	.058	3.67	-	-	-	-	-	-	-	.213
F14A	.633	.235	2.69	-	-	.009	.002	4.30	-	-	.641
S3A	.184	.064	2.87	-	-	-	-	-	-	-	.184
	CLASS 3 MAINTENANCE - DESIGN EQUIVALENT										
A4M	.031	.017	1.86	-	-	.006	.001	6.03	-	-	.037
A6E	.320	.119	2.69	-	-	-	-	-	-	-	.320
A7E	.179	.083	2.16	-	-	-	-	-	-	-	.179
AV8A	.172	.026	6.62	-	-	.001	.002	.67	-	-	.173
F4J	.504	.087	5.79	-	-	.001	.001	1.34	-	-	.505
F8J	.143	.058	2.46	-	-	-	-	-	-	-	.143
F14A	.421	.235	1.80	-	-	.005	.002	2.88	-	-	.429
S3A	.123	.064	1.92	-	-	-	-	-	-	-	.123

TABLE 5.24.4-2 REGRESSION ANALYSIS SUMMARY

WUC: 03S SYSTEM: CONDITIONAL INSPECTION

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI		ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	DENSITY LB/FT^3 (DEN)
	ACTUAL	CALCULATED			
A6E	.478	.503	-.025	26.0	18.05
A7E	.268	.381	-.113	18.9	19.89
AV8A	.257	.179	.078	12.0	17.91
F4J	.752	.691	.061	30.8	21.56
F14A	.633	.634	-.001	38.2	11.43

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	-0.4957 + 0.0229 (WTMT) +0.0224 (DEN)
CORRELATION COEFFICIENT	r =	0.9376
STANDARD ERROR OF ESTIMATE	S =	0.0232
CONFIDENCE LEVEL, 95%	2S =	±0.0464
NUMBER OF OBSERVATIONS	N =	5

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	DENSITY LB/FT^3 (DEN)
	ACTUAL	CALCULATED			
A4M	.017	.021	-.004	10.4	17.45
A7E	.083	.063	.020	18.9	19.89
AV8A	.026	.031	-.005	12.0	17.91
F4J	.087	.096	-.009	30.3	21.56
F8J	.058	.061	-.003	19.8	18.62
S3A	.064	.063	.001	26.6	14.94

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	-0.3111 + 0.0561 ln (WTMT) +0.0701 ln (DEN)
CORRELATION COEFFICIENT	r =	0.9355
STANDARD ERROR OF ESTIMATE	S =	0.0005
CONFIDENCE LEVEL, 95%	2S =	±0.0010
NUMBER OF OBSERVATIONS	N =	6

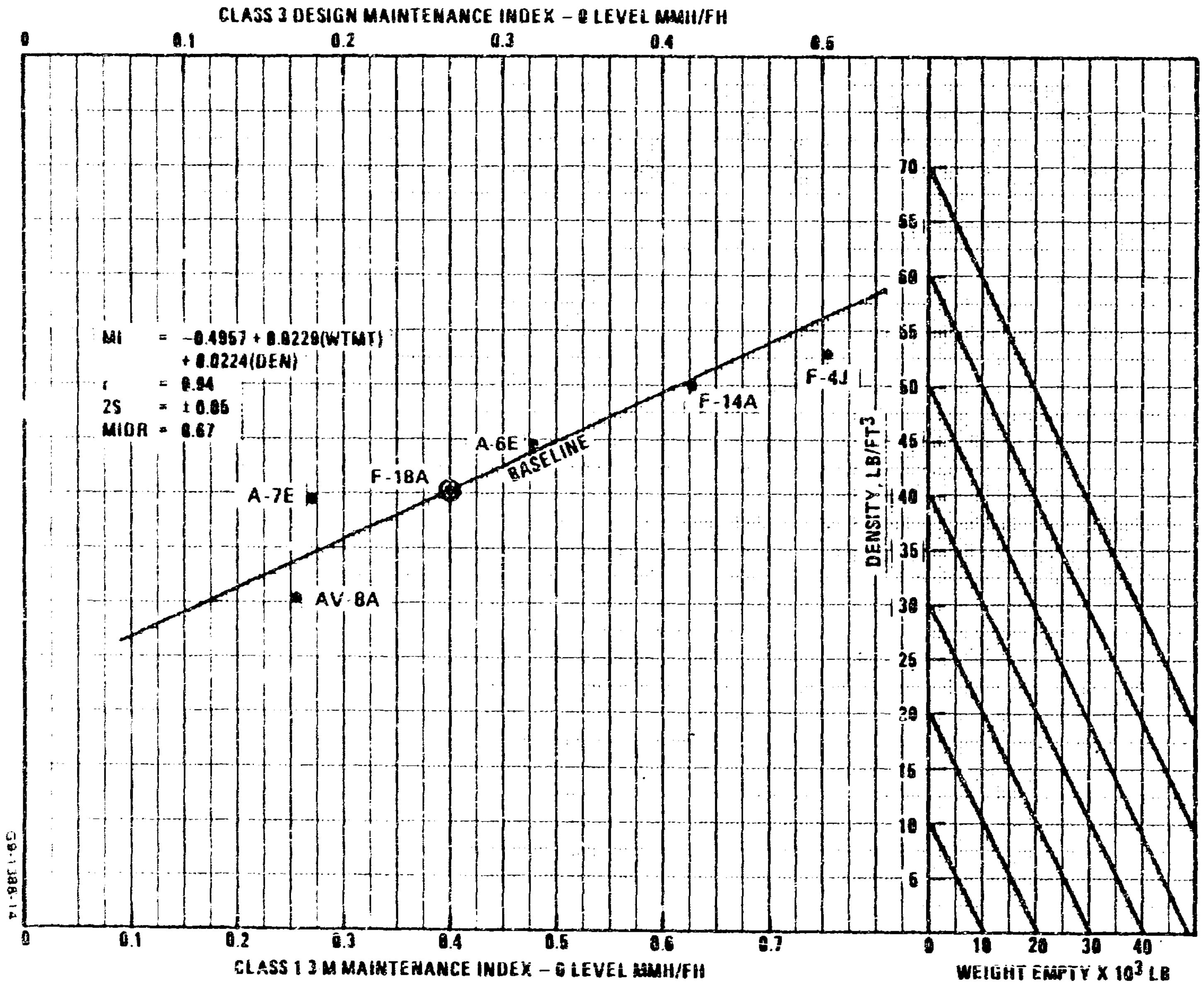

Figure 5.24.4-1 WUC 03S Conditional Inspection Maintenance Index Graph

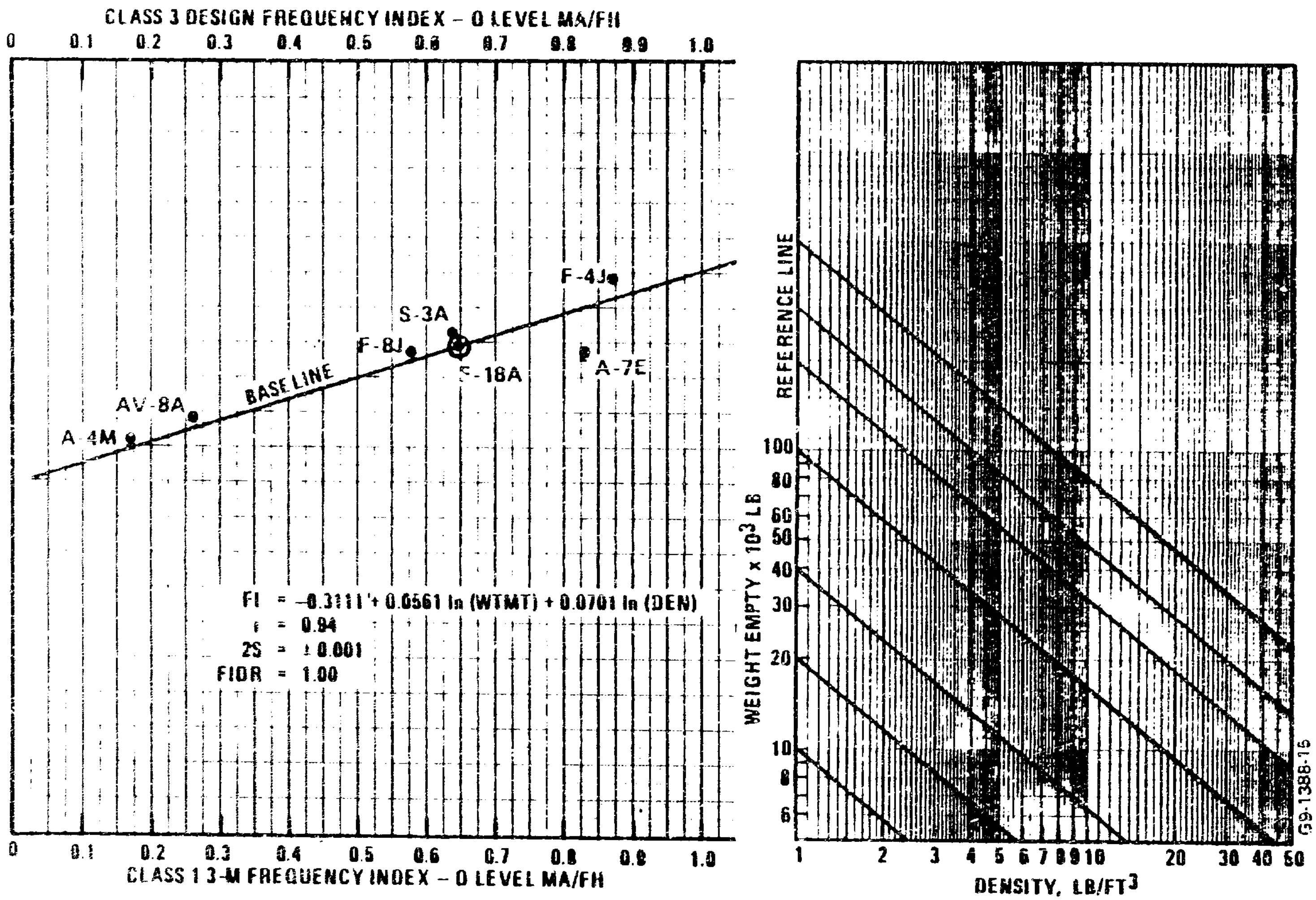

Figure 5.24.4-2 WUC 03S Conditional Inspection Frequency Index Graph

WUC: 073 CONTRACTOR:

SYSTEM: Conditional Inspection AIRCRAFT MODEL:

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Weight Empty, lbs. Fuselage Volume, ft^3 Density, lbs/ft^3	

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.01	
FIIR	MA/FH I LEVEL RATIO	.01	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) ±	%
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	$\text{MMH/FH}_O \div \text{MA/FH}_O$				
	÷				
	÷				
EMT/MA_O (4)	$\text{MMH/MA}_O \div \text{MEN}_O$				
	÷				
	÷				
MMH/FH_I (5)	$\text{MMH/FH}_O \times \text{MIIR}$				
	X				
	X				
MA/FH_I (6)	$\text{MA/FH}_O \times \text{FIIR}$				
	X				
	X				
MMH/MA_I (7)	$\text{MMH/FH}_I \div \text{MA/FH}_I$				
	÷				
	÷				
EMT/MA_I (8)	$\text{MMH/MA}_I \div \text{MEN}_I$				
	÷				
	÷				
$\text{MMH/FH}_{O,I}$ (9)	$\text{MMH/FH}_O + \text{MMH/FH}_I$				

Figure 5.24.4-3 Worksheet for Evaluating System Maintenance Requirements

5.24.5 OTHER INSPECTIONS - WUC 03Z

Selected Parameters: Fuselage wetted area, thrust/weight ratio, and density.

Number of Regression Equations Run: 6

Parameters Considered and Rejected: Weight empty, weight combat and weight maximum takeoff.

Comments: Standard WUC 03Z is defined to include those support action inspection tasks that are beyond the control and responsibility of a contractor. All maintenance reported against this code is the responsibility of the Navy (FIDR = 0.0, MIDR = 0.0). Data reported under SWUC 03Z is grouped by Support Action Code 03 (Inspection) and the following Type Maintenance Codes:

- A General Support
- E Acceptance/Transfer Inspection
- F Transient Maintenance
- L Local Manufacture
- T Supply Support
- U Reclamation and Salvage

Design parameters selected by the regression analysis program emphasized aircraft physical size and performance such as fuselage wetted area, density and thrust-to-weight ratio. Larger aircraft with higher thrust-to-weight ratios tend to require more miscellaneous scheduled maintenance.

Certain aircraft were deleted from the regression analysis because to include them would have distorted the trend for the majority of the aircraft.

TABLE 5.24.5-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 03Z SYSTEM: OTHER INSPECTIONS

ACFT	CLASS 1 MAINTENANCE - 3M										
	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
A4M	.375	.165	2.21	-	-	.103	.003	34.33	-	-	.478
A6E	.301	.082	3.67	-	-	.141	.012	11.75	-	-	.442
A7E	.245	.089	2.75	-	-	.003	.003	0.88	-	-	.248
AV8A	.710	.100	7.10	-	-	.073	.008	9.10	-	-	.783
F4J	.559	.107	5.21	-	-	.059	.009	6.55	-	-	.618
F8J	.607	.249	2.44	-	-	.004	-	-	-	-	.611
F14A	1.069	.067	15.95	-	-	.150	.015	10.03	-	-	1.219
S3A	.367	.046	5.80	-	-	.003	.003	1.00	-	-	.370
	CLASS 3 MAINTENANCE - DESIGN EQUIVALENT										
A4M				-	-				-	-	
A6E				-	-				-	-	
A7E				-	-				-	-	
AV8A				-	NOT APPLICABLE				-	-	
F4J				-					-	-	
F8J				-	-				-	-	
F14A				-	-				-	-	
S3A				-	-				-	-	

TABLE 5.24.5-2 REGRESSION ANALYSIS SUMMARY

WUC: 03Z SYSTEM: OTHER INSPECTIONS

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI		ERROR	FUSELAGE WETTED AREA X 10^3 FT^2 (FUSWET)	THRUST/WEIGHT RATIO (T/W)
	ACTUAL	CALCULATED			
A4M	.375	.346	.029	.487	1.076
A6E	.301	.335	-.034	1.006	.715
A7E	.245	.286	-.041	.749	.793
AV8A	.710	.723	-.013	.541	1.741
F4J	.559	.543	.016	.913	1.162
S3A	.367	.324	.043	1.004	.697

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	-0.4068 + 0.3538 (FUSWET) +0.5392 (T/W)
CORRELATION COEFFICIENT	r =	0.9804
STANDARD ERROR OF ESTIMATE	S =	0.0059
CONFIDENCE LEVEL, 95%	2S =	±0.0118
NUMBER OF OBSERVATIONS	N =	6

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	THRUST/WEIGHT RATIO (T/W)	DENSITY LB/FT^3 (DEN)
	ACTUAL	CALCULATED			
A6E	.082	.074	.008	.715	18.05
A7E	089	.090	-.001	.793	19.89
AV8A	.100	.098	.002	1.741	17.91
F4J	.107	.111	-.004	1.162	21.56
S3A	.046	.051	-.005	.697	14.94

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	0.0760 + 0.0245 (T/W) +0.0074 (DEN)
CORRELATION COEFFICIENT	r =	0.9767
STANDARD ERROR OF ESTIMATE	S =	0.0001
CONFIDENCE LEVEL, 95%	2S =	±0.0002
NUMBER OF OBSERVATIONS	N =	5

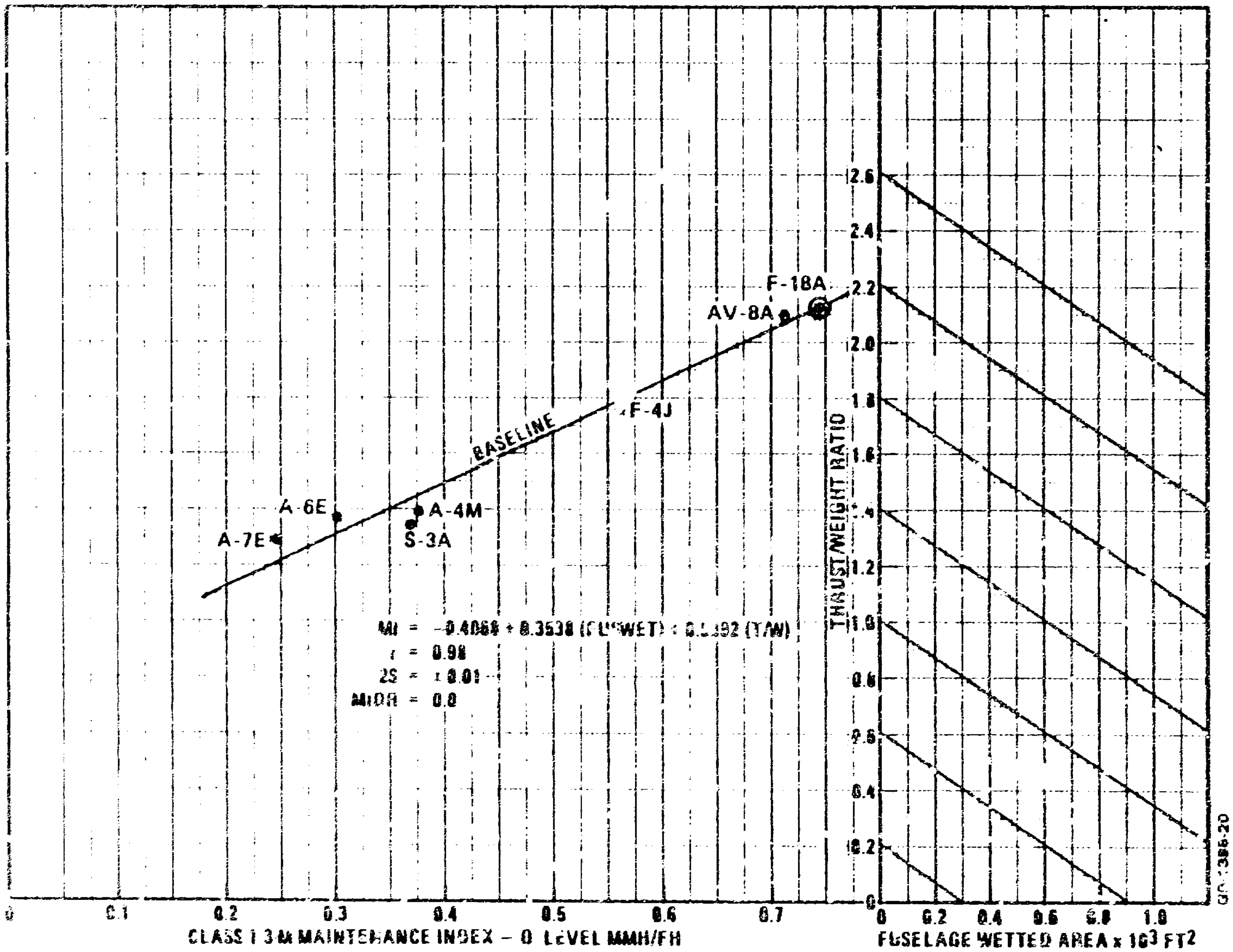

Figure 5.24.5-1 WUC 03Z Other Inspections Maintenance Index Graph

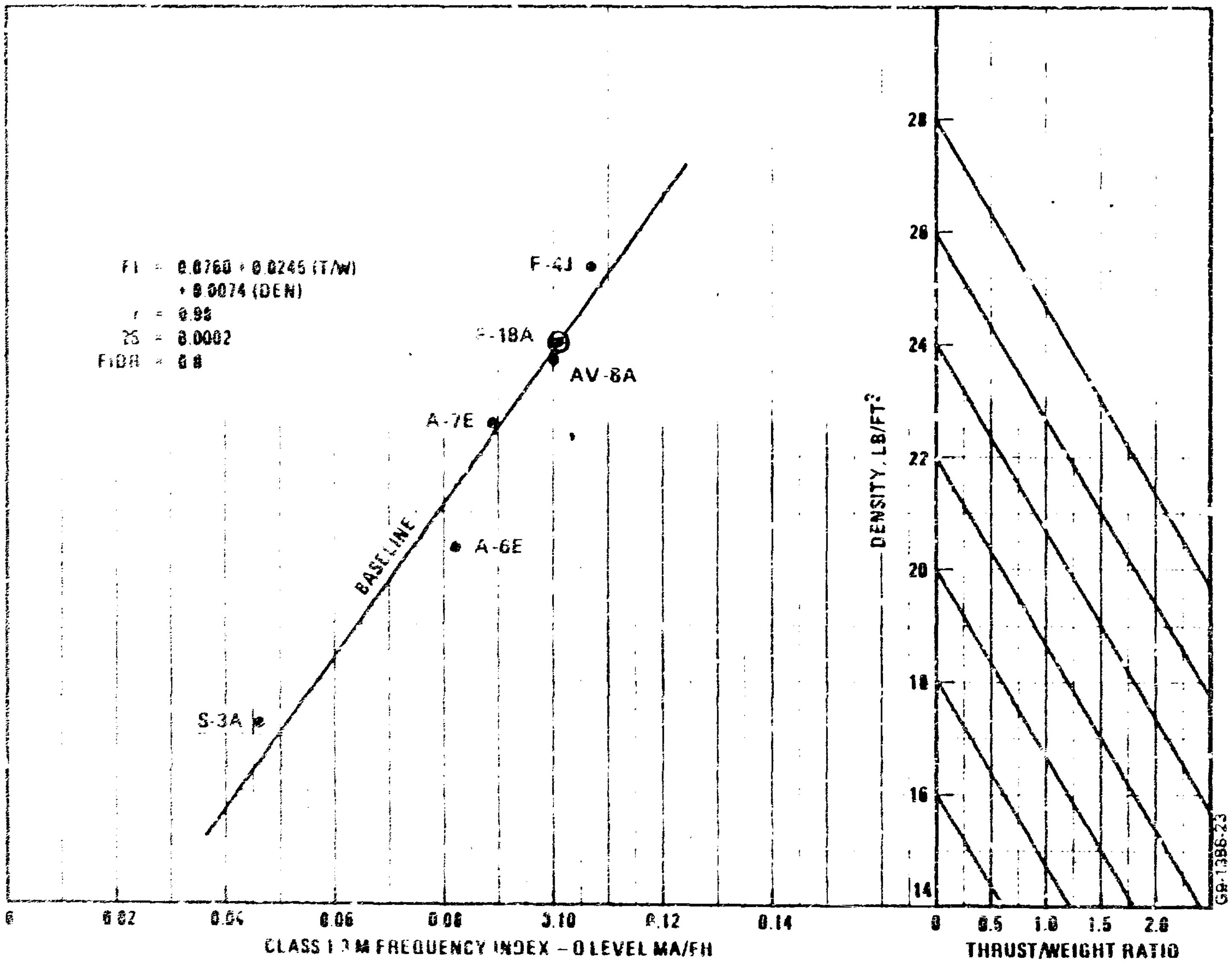

Figure 5.24.5-2 WUC 03Z Other Inspections Frequency Index Graph

WUC: 232 CONTRACTOR:
SYSTEM: Other Inspections AIRCRAFT MODEL:

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Fuselage Wetted Area, ft^2	
Thrust/Weight Ratio	
Density, lb/ft^3	

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.16	
FIIR	MA/FH I LEVEL RATIO	.07	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C)	
				1	2
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	MMH/FH_O ÷ MA/FH_O				
	÷				
	÷				
EMT/MA_O (4)	MMH/MA_O ÷ MEN_O				
	÷				
	÷				
MMH/FH_I (5)	MMH/FH_O × MIIR				
	×				
	×				
MA/FH_I (6)	MA/FH_O × FIIR				
	×				
	×				
MMH/MA_I (7)	MMH/FH_I ÷ MA/FH_I				
	÷				
	÷				
EMT/MA_I (8)	MMH/MA_I ÷ MEN_I				
MMH/FH_{O+I} (9)	MMH/FH_O + MMH/FH_I				

Figure 5.24.5-3 Worksheet for Evaluating System Maintenance Requirements

5.25 CORROSION PREVENTION - WUC 04

Selected Parameters: Fuselage wetted area and thrust/weight ratio.

Number of Regression Equations Run: 9

Parameters Considered and Rejected: Density, weight empty, max speed, weight combat, and weight maximum takeoff.

Comments: Corrosion Prevention is considered a design related support action task. All maintenance actions reported against this code are the responsibility of the contractor (FIDR = 1.0) while only 67% of the maintenance time is contractor controllable (MIDR = 0.67). Data reported under this code is grouped by Support Action Code 04 and all Type Maintenance Codes.

Regression analysis showed that fuselage wetted area and total aircraft thrust-to-weight ratio were the most statistically valid design parameters. Certain aircraft were deleted from the analysis because to include them would have distorted the trend for the majority of the aircraft.

This task is very dependent on aircraft age. New aircraft require less corrosion prevention than older aircraft. A case history study on one type aircraft showed average annual MMH/FH has tripled from the first through the seventh year of operation. A leveling off in MMH/FH was noted on that aircraft about two years after IOC.

TABLE 5.25-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 040 SYSTEM: CORROSION PREVENTION

ACFT	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
CLASS 1 MAINTENANCE - 3M											
A4M	.191	.076	2.51	-	-	.032	.011	2.91	-	-	.223
A6E	1.069	.193	5.54	-	-	.082	.040	2.05	-	-	1.151
A7E	1.722	.321	5.36	-	-	.030	.048	.63	-	-	1.752
AV8A	1.290	.192	6.71	-	-	.015	.007	2.14	-	-	1.305
F4J	1.935	.318	6.08	-	-	.051	.028	1.82	-	-	1.986
F8J	1.538	.297	5.18	-	-	.010	.014	.71	-	-	1.548
F14A	3.314	.512	6.47	-	-	.056	.027	2.07	-	-	3.370
S3A	.808	.307	2.63	-	-	.013	.007	1.85	-	-	.821
CLASS 3 MAINTENANCE - DESIGN EQUIVALENT											
A4M	.128	.076	1.68	-	-	.021	.011	1.95	-	-	.149
A6E	.716	.193	3.71	-	-	.055	.040	1.37	-	-	.771
A7E	1.153	.321	3.59	-	-	.020	.048	.42	-	-	1.173
AV8A	.863	.192	4.50	-	-	.010	.007	1.43	-	-	.873
F4J	1.295	.318	4.07	-	-	.034	.028	1.22	-	-	1.330
F8J	1.031	.297	3.47	-	-	.007	.014	.48	-	-	1.037
F14A	2.219	.512	4.34	-	-	.037	.027	1.39	-	-	2.257
S3A	.541	.307	1.76	-	-	.009	.007	1.24	-	-	.550

TABLE 5.25-2 REGRESSION ANALYSIS SUMMARY

REV A

WUC: 040 SYSTEM: CORROSION PREVENTION

MAINTENANCE INDEX ESTIMATION - MMH/FH O LEVEL

ACFT	3M MI		ERROR	FUSELAGE WETTED AREA X 10^3 FT^2 (FUSWET)	THRUST/WEIGHT RATIO (T/W)
	ACTUAL	CALCULATED			
A4M	.191	.308	-.117	.487	1.076
A6E	1.069	1.125	-.056	1.006	.715
AV8A	1.290	1.478	-.188	.541	1.741
F4J	1.935	1.569	.366	.913	1.162
A8J	1.538	1.165	.373	.861	.990
F14A	3.314	3.409	-.945	1.647	1.094
S3A	.808	1.091	-.283	1.004	.697

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	-2.6456 + 2.6493 (FUSWET) +1.5454 (T/W)
CORRELATION COEFFICIENT	r =	0.9642
STANDARD ERROR OF ESTIMATE	S =	0.4142
CONFIDENCE LEVEL, 95%	2S =	±0.8284
NUMBER OF OBSERVATIONS	N =	7

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	FUSELAGE WETTED AREA X 10^3 FT^2 (FUSWET)	
	ACTUAL	CALCULATED			
A4M	.076	.125	-.049	.487	
A7E	.321	.259	.062	.749	
AV8A	.192	.158	.034	.541	
F4J	.318	.321	-.003	.913	
F8J	.297	.303	-.006	.861	
F14A	.512	.506	.006	1.647	
S3A	.307	.351	-.044	1.004	

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	0.3948 + 0.3130 ln (FUSWET)
CORRELATION COEFFICIENT	r =	0.9551
STANDARD ERROR OF ESTIMATE	S =	0.0094
CONFIDENCE LEVEL, 95%	2S =	±0.0188
NUMBER OF OBSERVATIONS	N =	7

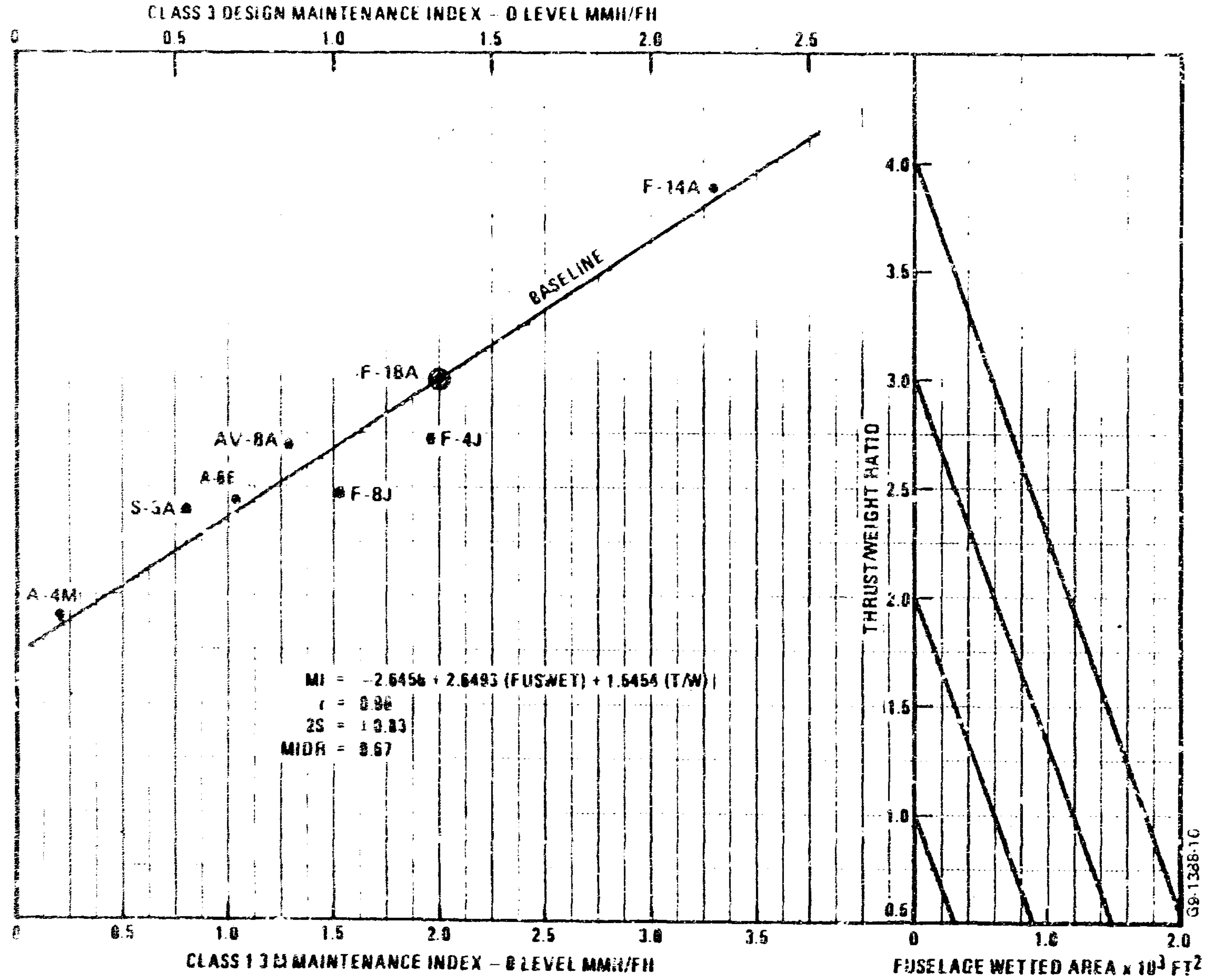

Figure 5.25-1 C 040 Corrosion Prevention Maintenance Index Graph

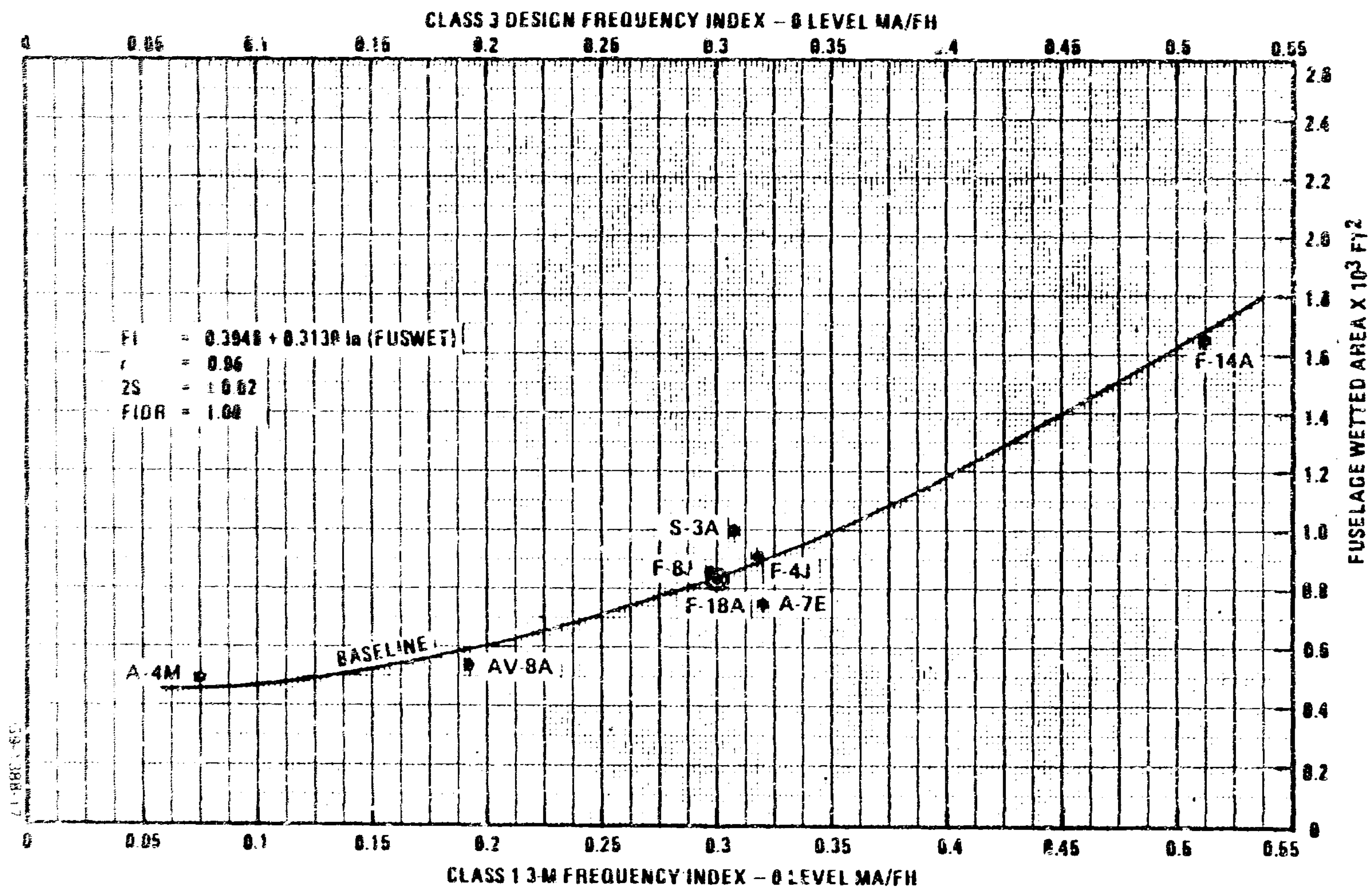

Figure 5.25-2 WUC 040 Corrosion Prevention Frequency Index Graph

WUC: 04

CONTRACTOR:

SYSTEM: Corrosion Prevention

AIRCRAFT MODEL:

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Fuselage Wetted Area, ft^2 Thrust/Weight Ratio	

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.04	
FIIR	MA/FH I LEVEL RATIO	.09	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C) Δ	%
MMH/FH_O	MAINT. INDEX GRAPH				
	BASELINE				
(1)	PREDICTED				
MA/FH_O	FREQ. INDEX GRAPH				
(2)	BASELINE				
	PREDICTED				
MMH/MA_O	$MMH/FH_O \div MA/FH_O$				
	÷				
(3)	÷				
EMT/MA_O	$MMH/MA_O \div MEN_O$				
	÷				
(4)	÷				
MMH/FH_I	MMH/FH_O X MIIR				
	X				
(5)	X				
MA/FH_I	MA/FH_O X FIIR				
(6)	X				
	X				
MMH/MA_I	$MMH/FH_I \div MA/FH_I$				
	÷				
(7)	÷				
EMT/MA_I	$MMH/MA_I \div MEN_I$				
	÷				
(8)	÷				
$MMH/FH_{(O+I)}$ (9)	$MMH/FH_O + MMH/FH_I$				

Figure 5.25-3 Worksheet for Evaluating System Maintenance Requirements

5.26 SHOP SUPPORT - WUC 05

Selected Parameters: Weight empty, and thrust/weight ratio.

Number of Regression Equations Run: 4

Parameters Considered and Rejected: Weight combat and weight maximum takeoff.

Comments: Standard WUC 05 is defined to include those support action tasks that are beyond the control and responsibility of a contractor. All maintenance reported against this code is the responsibility of the Navy (FIDR = 0.0, MIDR = 0.0). Data reported under SWUC 05 includes the following support actions:

- 05 General Functions
- 06 Buildup and Teardown/Engine Test Stand Operation
- 07 Mission Shop Support
- 08 Inspection of Aviator's Equipment
- 09 Non-Aeronautical Work

Regression analysis for both the Maintenance and Frequency Index equations showed that weight empty and thrust-to-weight ratio were the most statistically valid design parameters. Certain sub-tasks identified in Ref. 31 were adjusted to the Fleet average to insure a more representative data sample. As shown below, actual MMH/FH values for some aircraft exceeded the norm because of unique maintenance requirements. Adjustments were made by averaging MMH/FH values for the remaining aircraft reporting maintenance data against that given sub-task. A similar adjustment was made for MA/FH.

WUC	SUB-TASK	A/C	CLASS 1 O-LEVEL MMH/FH	ADJUSTED TO FLEET AVG.
052	Painting	F-8J	.370	.102
057	Test/Inspect/Service	AV-8A	.635	.026
070	Mission Shop Support	F-8J	.58[illegible]	.171
076	Sonobuoys	S-3A	.130	.000
077	ECM/Chaff	A-4M	.233	.013
078	Tape/Film	A-4M	.441	.025
090	Non-Aero Work	AV-8A	.417	.060

TABLE 5.26-1 TWO-DIGIT WUC MAINTENANCE DATA SUMMARY

WUC: 05 SYSTEM: SHOP SUPPORT

ACFT	CLASS 1 MAINTENANCE - 3M										
	O LEVEL					I LEVEL					TOTAL
	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH	MA/FH	MMH/MA	EMT/MA	MEN	MMH/FH
A4M	.520	.312	1.66	-	-	.655	.153	4.28	-	-	1.175
A6E	.608	.327	1.86	-	-	.334	.193	1.99	-	-	.992
A7E	.606	.354	1.66	-	-	.090	.091	.09	-	-	.696
AV8A	.812	.411	1.97	-	-	.519	.[illegible]37	1.81	-	-	1.331
F4J	1.041	.590	1.76	-	-	1.036	.894	1.16	-	-	2.077
F8J	.727	.341	2.13	-	-	.390	1.493	.25	-	-	1.117
F14A	.941	.170	5.54	-	-	1.471	1.424	1.03	-	-	2.412
S3A	.703	.429	1.64	-	-	.276	.147	1.87	-	-	.979
	CLASS 3 MAINTENANCE - DESIGN EQUIVALENT										
A4M				-	-				-	-	
A6E				-	-				-	-	
A7E				-	-				-	-	
AV8A				-					-	-	
F4J				-	NOT APPLICABLE				-	-	
F8J				-					-	-	
F14A				-	-				-	-	
S3A				-	-				-	-	

REV A

TABLE 5.26-2 REGRESSION ANALYSIS SUMMARY

REV A

WUC: 05 SYSTEM: SHOP SUPPORT

MAINTENANCE INDEX ESTIMATI - MMH/FH O LEVEL

ACFT	3M MI		ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	THRUST/WEIGHT RATIO (T/W)
	ACTUAL	CALCULATED			
A4M	.520	.531	-.011	10.4	1.076
A6E	.608	.661	-.053	26.0	.715
A7E	.606	.597	.009	18.9	.793
AV8A	.812	.819	-.007	12.0	1.741
F4J	1.041	.961	.080	30.8	1.162
F8J	.727	.723	.004	19.8	.990
F14A	.941	1.009	-.068	38.2	1.094
S3A	.703	.657	.046	26.6	.697

STATISTICAL PARAMETERS:

REGRESSION EQUATION	MI =	-0.3510 + 0.3613 ln (WTMT) +0.4916 ln (T/W)
CORRELATION COEFFICIENT	r =	0.9625
STANDARD ERROR OF ESTIMATE	S =	0.0163
CONFIDENCE LEVEL, 95%	2S =	±0.0326
NUMBER OF OBSERVATIONS	N =	8

FREQUENCY INDEX ESTIMATION - MA/FH O LEVEL

ACFT	3M FI		ERROR	WEIGHT EMPTY X 10^3 LBS (WTMT)	THRUST/WEIGHT RATIO (T/W)
	ACTUAL	CALCULATED			
A4M	.312	.285	.027	10.4	1.076
A7E	.364	.349	.015	18.9	.793
AV8A	.411	.417	-.006	12.0	1.741
F4J	.590	.567	.023	30.8	1.162
F8J	.341	.394	-.053	19.8	.990
S3A	.429	.434	-.005	26.6	.697

STATISTICAL PARAMETERS:

REGRESSION EQUATION	FI =	-0.0316 + 0.013 (WTMT) +0.1675 (T/W)
CORRELATION COEFFICIENT	r =	0.9549
STANDARD ERROR OF ESTIMATE	S =	0.0043
CONFIDENCE LEVEL, 95%	2S =	±0.0086
NUMBER OF OBSERVATIONS	N =	6

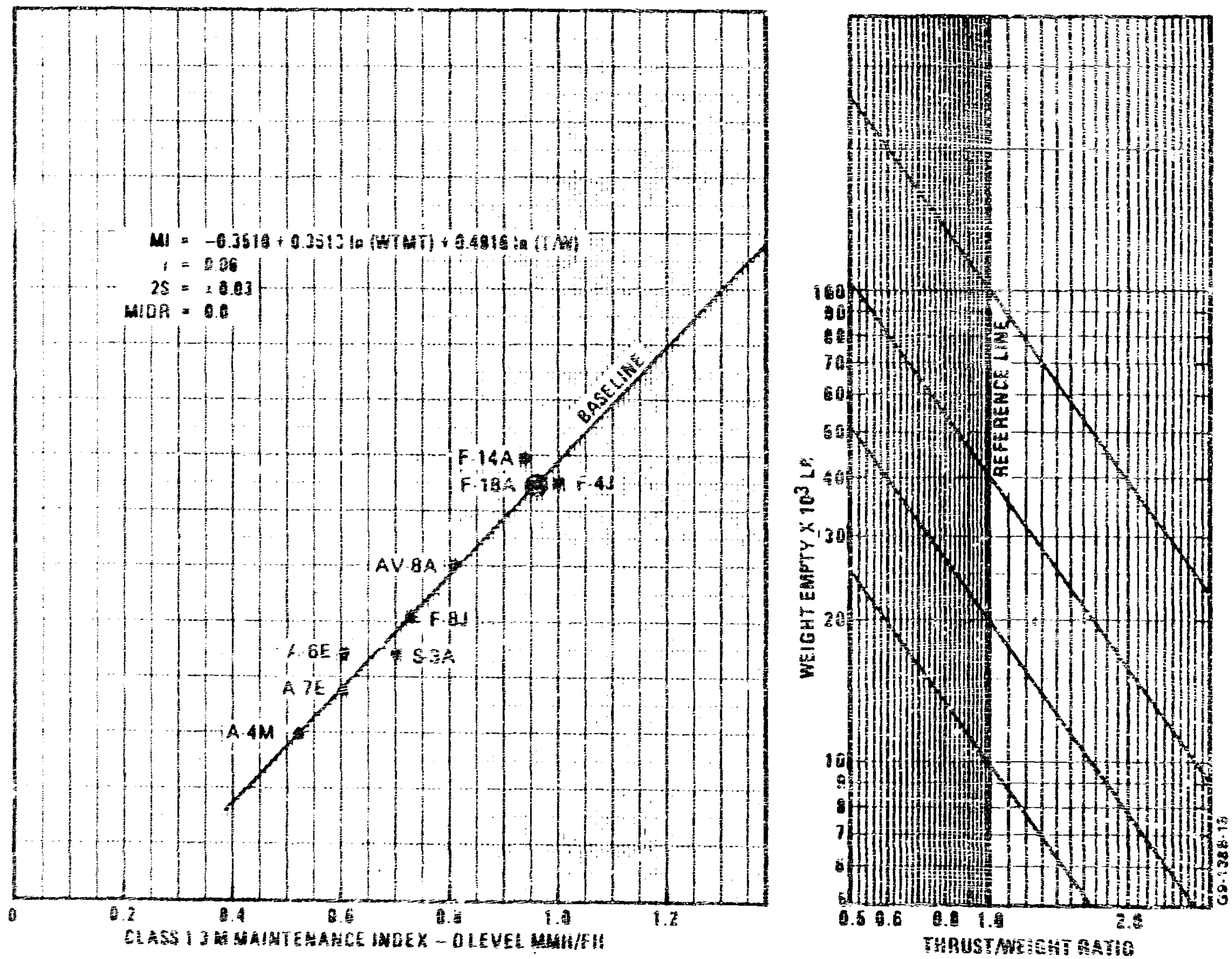

Figure 5.26-1 WUC 05 Shop Support Maintenance Index Graph

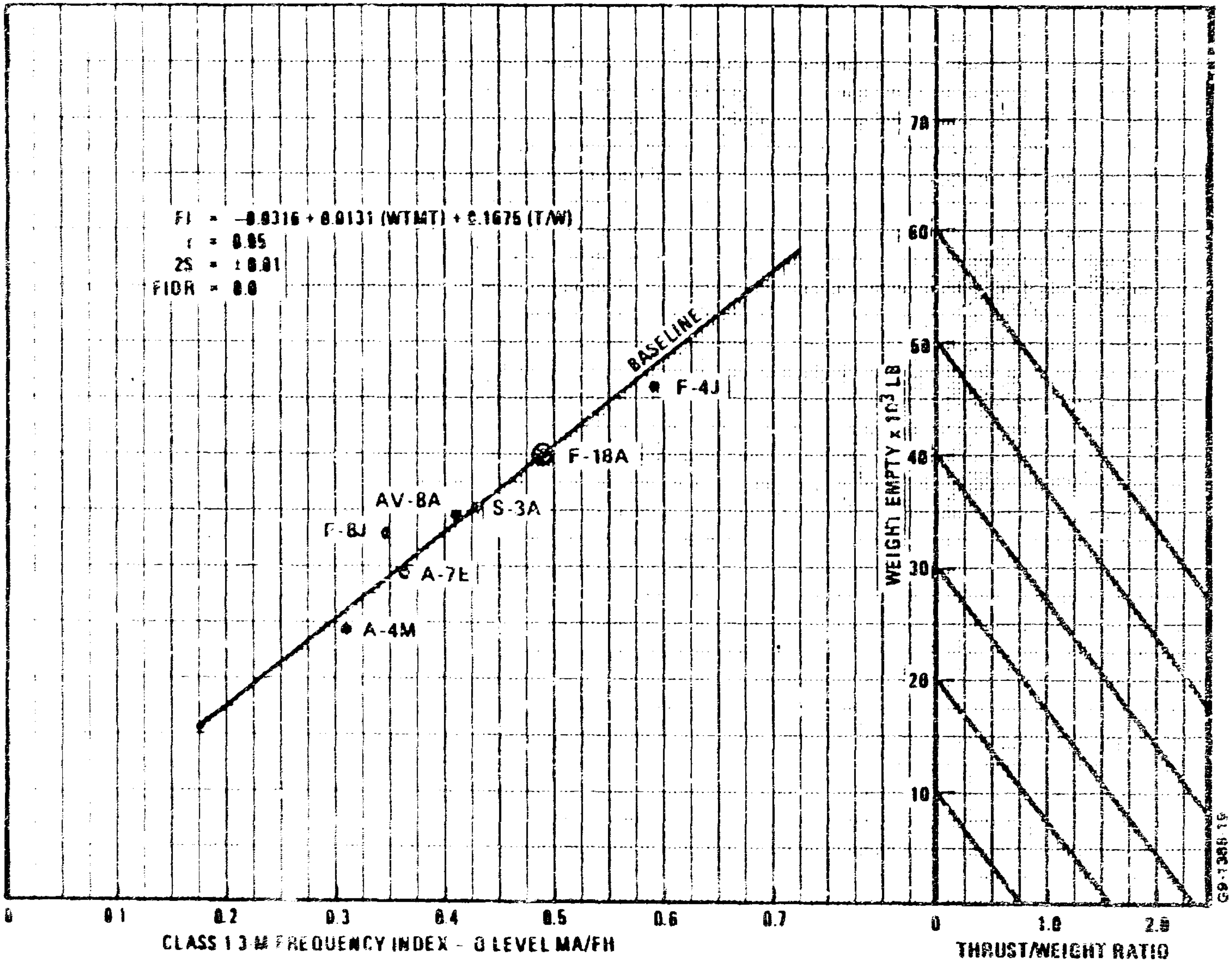

Figure 5.26-2 WUC 05 Shop Support Frequency Index Graph

WUC: 05 CONTRACTOR: ______

SYSTEM: [illegible] AIRCRAFT MODEL: ______

PART I CONTRACTOR DATA

CONTRACTOR PREDICTIONS – CLASS 3 DESIGN MAINT. REQ.				
ML	MMH/FH	MA/FH	MMH/MA	EMT/MA
O				
I				

DESIGN/PERFORMANCE PARAMETERS	
Weight Empty, lbs. Thrust/Weight Ratio	

PART II SYSTEM CONSTANTS

PARAMETER		BASE	PRED
MEN_O	AVG NO. MEN – O LEVEL	---	
MEN_I	AVG NO. MEN – I LEVEL	---	
MIIR	MMH/FH I LEVEL RATIO	.77	
FIIR	MA/FH I LEVEL RATIO	.65	

PART III SYSTEM ANALYSIS

PARAMETER	CALCULATION	BASELINE CLASS 1 3-M DATA (A)	PREDICTED CLASS 1 3-M DATA (B)	IMPROVEMENT (DEGRADATION) (C)	
				Δ	%
MMH/FH_O (1)	MAINT. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MA/FH_O (2)	FREQ. INDEX GRAPH				
	BASELINE				
	PREDICTED				
MMH/MA_O (3)	MMH/FH_O ÷ MA/FH_O				
	÷				
	÷				
EMT/MA_O (4)	MMH/MA_O ÷ MEN_O				
	÷				
	÷				
MMH/FH_I (5)	MMH/FH_O X MIIR				
	X				
	X				
MA/FH_I (6)	MA/FH_O X FIIR				
	X				
	X				
MMH/MA_I (7)	MMH/FH_I ÷ MA/FH_I				
	÷				
	÷				
EMT/MA_I (8)	MMH/MA_I ÷ MEN_I				
	÷				
	÷				
MMH/FH_{O+I} (9)	MMH/FH_O + MMH/FH_I				

Figure 5.26-3 Worksheet for Evaluating System Maintenance Requirements

28. Work Unit Code Manual, U. S. Navy Series P-3 Aircraft. NAVAIR 01-75PA-8. Naval Air Systems Command, U. S. Navy, Washington, D. C., January 15, 1976.

29. Work Unit Code Manual, U. S. Navy Series S-3 Aircraft. NAVAIR 01-S3AA-8. Naval Air Systems Command, U. S. Navy, Washington, D. C., August 1, 1974.

30. Work Unit Code Manual, U. S. Navy Series V-8 Aircraft. NAVAIR 01-V8-8. Naval Air Systems Command, U. S. Navy, Washington, D. C., December 1, 1975.

31. Support Action Codes. COMNAVAIRPACNOTE 4790, 2 November 1972.